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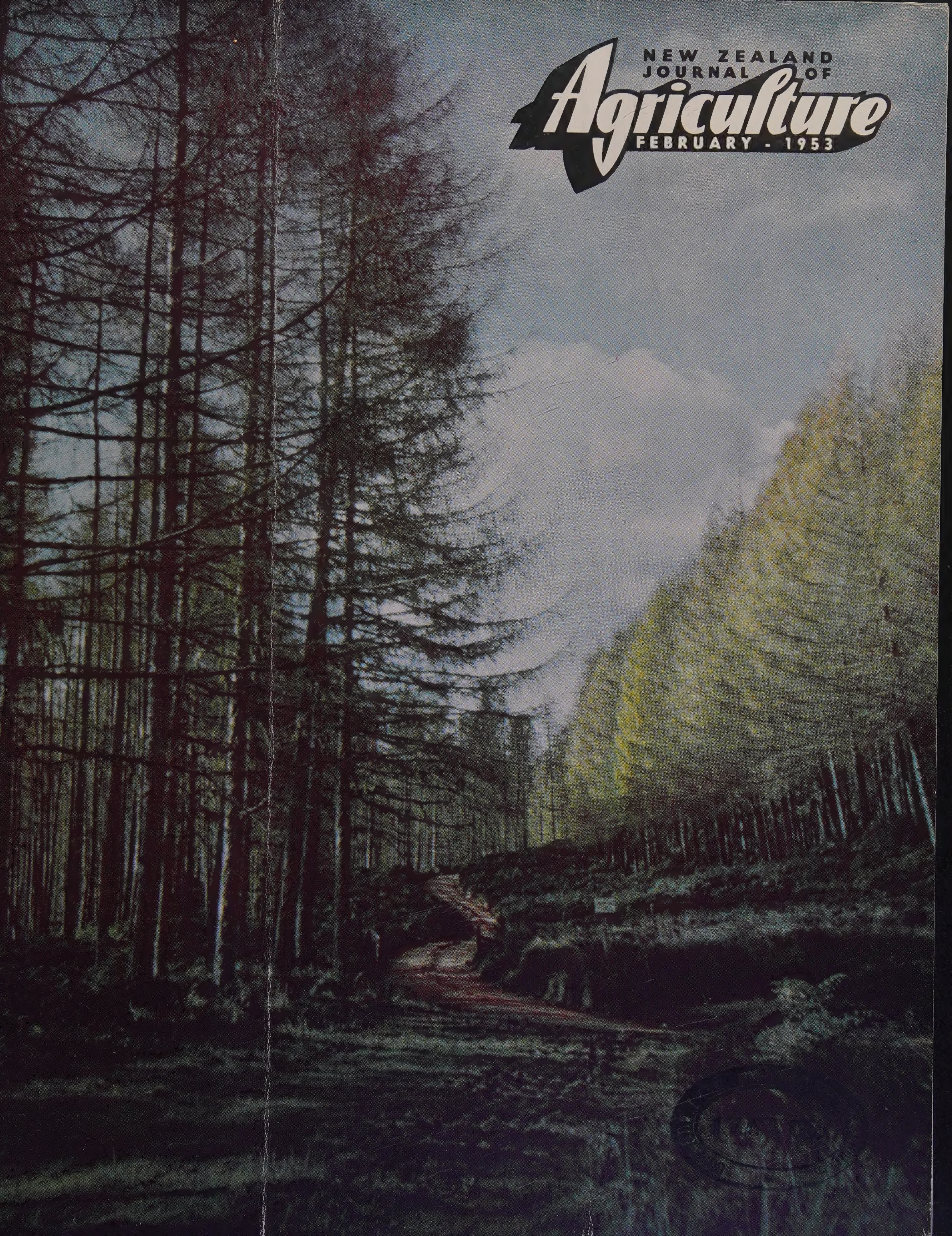

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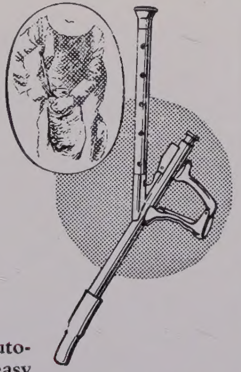

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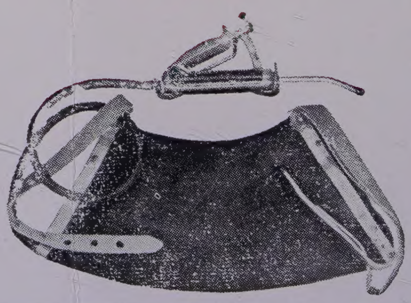

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## *This Month's Cover*

*This month's cover, which has been reproduced from a colour photograph taken by D. R. Brenchley about 21 miles from Rotorua on the main Waikaremoana road, shows a larch plantation in autumn foliage in the Waiotapu subdivision of the Kaingaroa State Forest. The largest man-made forest in the world, the Kaingaroa State Forest contains many different species of trees. The softwoods shown,* Larix decidua, *were planted in 1910. They mature in from 60 to 80 years and yield a superior timber very suitable for building purposes. The stand shown on the right of the cover is untreated and that on the left was thinned in 1949 and under-planted in Douglas fir.*

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## TABLE OF CONTENTS

Reclamation and Development of Marginal Hill Country at Invermay Research Station .. N. A. Cullen .. 98
Pedigree Sow Records .. .. .. .. .. .. .. .. 104
Importance of Protein in Poultry Rations .. F. C. Bobby .. 105
Faulty Threshing of Peas Must be Avoided .. C. J. Crosbie .. 109
Smooth Granulation in Honey .. .. .. C. R. Paterson .. 116
Meteorological Records for December .. .. .. .. .. 118
Disease in the Household Poultry Flock .. .. .. .. .. 119
Care of Livestock during March .. .. .. .. .. .. 120
Dairy Produce Graded for Export .. .. .. .. .. 120
Autumn-sown Pastures and Grass-grub Control (Seasonal Notes) .. .. .. .. .. .. .. .. 121
Results from Growing of Hilgendorf Wheat .. L. G. L. Copp and E. W. Hullett .. 123
Secondary Sowings on Hill Country .. .. E. A. Madden .. 124
20 Commandments for Good Pig Management E. D. Edwards .. 125
Radio Broadcasts .. .. .. .. .. .. .. .. .. 128
Lemon Orchard Practice in Relation to Packing House Costs and Fruit Wastage .. .. W. A. Fletcher .. 129
The Home Garden .. .. .. .. .. J. T. McConachie and C. L. Napier .. 133
Show Dates .. .. .. .. .. .. .. .. .. 140
Oversowing and Topdressing North Otago Hill Country .. .. .. .. .. .. W. R. Lobb .. 141
Recent Research Work: Phosphatic Fertilisers .. .. .. .. 146
Fruit Growing at Kerikeri .. .. .. .. J. A. Cederman .. 147
Development of Browntop Country in the South Island .. .. .. .. .. .. A. Stuart .. 155
Stabilising Sand Country at Flock House Farm of Instruction .. .. .. .. .. D. I. Glue .. 165
Domestic Beekeeping .. .. .. .. T. P. J. Williams .. 171
Cheaper Meat Dishes .. .. .. .. Molly Macpherson .. 172
The Flower Garden .. .. .. .. .. H. P. Thomas and C. K. Ellis .. 177
New Clothes for Children from Adults' Discards Eirene E. Unwin .. 183
Mountain Pawpaws .. .. .. .. .. Nell Macpherson .. 189

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**HEADING PHOTOGRAPH:** Second-class undulating country, showing enclosed trial area in left foreground and improved pasture in middle distance.

# Reclamation and Development of Marginal Hill Country at Invermay Research Station

By N. A. CULLEN, Research Officer, Department of Agriculture
Invermay Research Station

THE problem of hill country deterioration, whether from reversion of sown pasture to fern, scrub, and bush, or as the result of accelerated erosion of natural tussock country induced by overburning, overgrazing, and other faulty management practices, has been recognised and discussed for at least the last half century. The problem has become more pressing since the war, as a rising world demand for meat and wool and the intensification of production on the better soils have caused an increased demand for store stock. Further, highly improved farms now sell at high prices and those in search of land must consider development of second-class and marginal areas, chief among which are the pumice soils, gumland and peat areas, marshland, coastal sand dunes, and the large areas of third-class hill country.

MANY thousands of acres of hill country at present making a negligible contribution to farm production are capable of being developed to give high-producing pastures carrying several ewes to the acre. This marginal country when fully developed could make a major contribution toward New Zealand's primary production.

## Problems and Factors in Development

Lack of finance is probably the greatest single factor limiting reclamation and development of hill country. This work involves a large capital outlay for expensive tractors and heavy equipment, seeds and fertilisers, fencing materials, drains and access roads, water reticulation, and shelter.

As well as capital costs, maintenance and labour charges must be taken into account. These will consist largely of repair and depreciation charges on tractors, equipment, fences, roads, and drains, together with the costs of maintenance dressings of lime and fertilisers.

The development of the low-producing, third-class hill country at Invermay Research Station has been undertaken with the main objective of converting low-producing, scrub-covered country and browntop-dominant pasture into high-producing pastures capable of carrying 3 or more ewes to the acre.

Methods of land development are under study and records of costs are being kept. Trials covering the various managerial, technical, and economic aspects have been planned and laid down, both on plot and farm scale. These investigate aspects of cultivation, lime and fertiliser requirements, species of grasses and clovers most suited for this country, oversowing trials with grasses and clovers, and weed-control experiments, particularly on brush weeds.

## Topography, Soil Type, Herbage Cover

The marginal hill country at Invermay Research Station is typical of an extensive area in Otago and Southland. In its natural state the land has a low carrying capacity, about 1 sheep to 3 acres, and is steep, stony, and extensively covered with gorse, manuka, browntop, and low-producing native grass species, tussocks, and weeds. The soil consists of 4 to 10in. of silty loam topsoil overlying a heavy clay. This soil is characterised by impeded drainage, presents cultivation difficulties, and is prone to erosion from underrunners and slips.

## METHODS ADOPTED

District standard practice is being tried in comparison with various alternative methods consisting of:—

1. Giant discing.
2. Shallow ploughing compared with deep ploughing.
3. Oversowing of grasses and clovers in both spring and autumn topdressing.
    - (a) With surface cultivation and lime and phosphate topdressing.
    - (b) With liming and phosphate topdressing but without surface cultivation.
    - (c) Without any liming, topdressing, or preparatory cultivation.
    - (d) As in (b) but with clover hay being fed to cattle on the area in addition.
4. The use of hormone weedkillers to control gorse and brush weeds, together with oversowing and stock-management practices.

### Standard Practice

Where large manuka and gorse bushes are present, clearing, burning, and crushing are imperative before ploughing. A blade mounted on a tracklaying tractor is used to crush gorse, root out large trees, remove boulders and stumps, and fill in hollows and underrunners. Where the top brush cover is dense deep ploughing (to a depth of 7 to 9in.) has to be resorted to so that the undergrowth can be completely buried. Where less brush growth is present shallower ploughing (6 to 7in.) is done so that as little clay as possible is brought to the surface.

After ploughing, the ground is fallowed for 6 to 12 months or longer, either in the furrow or after giant discing. Fallowing aids in the breakdown and consolidation of the soil and so facilitates subsequent cultivation. The texture of the soil is further improved by a dressing of from 30cwt. to 2 tons of lime per acre, this dressing usually being applied before the sowing of the first crop.

The cultivation methods used in preparation for sowing either a forage crop or new grass are largely dependent on seasonal conditions and the duration of the fallow. Initial working down and consolidation are effected by two or three cuts of the giant and tandem discs, and the heavy harrows and roller are used in subsequent cultivations to consolidate the soil further and to obtain a fine tilth.

Where a forage crop is to be sown the ground is worked ready for sowing in November or December, but for the sowing of new pasture the preparation of the final seed-bed may be delayed until January or early February. Sowings of new grass are not made later than this time because of the danger of frost lift on the newly sown clovers.

**Rotation Followed**

Choice of rotation depends on such factors as the need for winter feed, the length of the fallow, the fertility of the soil, the provision of fattening feed, and whether immediate regrassing is desired. The standard rotation is to sow to new grass after 1 or 2 years' forage cropping with swedes, rape, or soft turnips. Occasionally a cereal crop of oats or ryecorn may be sown.

Forage cropping can be omitted from the rotation and the area sown directly to new grass. On the more fertile soils swedes are sown in preference to soft turnips, the usual practice being to ridge swedes in 26in. rows. Soft turnips are ridged or drilled. New grass is sown either alone after a fallow or with a light seeding of rape as a cover crop. In this way a strong sward, capable of competing with any volunteer species which may prove troublesome, is secured.

A routine similar to that described has been followed in developing about 140 acres of third-class land at Invermay.

### Alternative Methods

Some of the alternative methods tried and trials laid down are described below.

**Giant Discing**

In May 1950 most of about 20 acres was cultivated with the use of giant discs instead of swamp plough, the rest being ploughed. After large gorse bushes and clumps of manuka and gorse had been burnt the area was giant disced, three cuts being needed to break up thoroughly the dense sward covered with browntop and gorse.

After a 4 months' fallow the area was worked with tandem discs and heavy harrows to prepare a seed-bed for sowing new pasture. The preparation of a suitable seed-bed proved difficult, as consolidation was difficult to obtain because of the friable nature of the soil and the presence of litter and trash which had been worked through the soil. On this area no forage crops were grown, as it was desired to observe whether successful direct pasture establishment was possible.

Typical third-class broken hill country in background. The paddock on the right has been neglected and is reverting to gorse and manuka. Improved pasture is shown on the left and oat stubble in foreground.

The new grass was sown in January 1951 with 3cwt. of superphosphate and 25cwt. of lime per acre, the seed mixture being as follows: Certified perennial ryegrass 1½ bushels, Certified cocksfoot 3lb., Certified New Zealand white clover 3lb., Certified Montgomery red clover 3lb., and crested dogstail 1lb.

The portion of the area that was ploughed received identical treatment to the disced portion. Pasture establishment was good on both areas and little difference could be detected in the establishment of the species.

Giant discing has had few advantages over ploughing at Invermay, as the advantage of rapid coverage of the area is offset by the increased number of cultivations necessary in seed-bed preparation. Giant discing may offer advantages in soil conservation work on steep slopes in the higher-rainfall areas, since the worked-in litter appears to act as a soil stabiliser and to reduce scouring. Scouring appeared worse on the portion of the area that had been ploughed.

### Shallow Ploughing with Direct Sowing to Cocksfoot-dominant Mixture

In May 1950 a further 20 acres of hill country similar to the 20 acres giant disced was shallow ploughed (5 or 6in. deep) and sown to new grass in January 1951. This area had treatment identical with that given the giant-disced block and both were sown at the same time. On the ploughed area the following mixture was sown: Certified perennial ryegrass 10lb., Certified cocksfoot 10lb., Certified Montgomery red clover 4lb., Certified New Zealand white clover 3lb., and crested dogstail 2lb. This mixture was sown with 3cwt. of superphosphate and 25cwt. of lime per acre.

A comparison of this area with the giant-disced block (portion of which was ploughed but sown with a different mixture) showed better initial establishment with the cocksfoot-dominant mixture. A good strike and good establishment were obtained on both areas, but the sward appeared denser with the cocksfoot-dominant mixture on the ploughed area.

In the months after sowing both areas showed the yellowing and unthriftiness typical of nitrogen deficiency, but these symptoms had disappeared by the spring of 1951 and the pasture from then onward appeared vigorous and healthy.

On both blocks heavy concentrations of sheep and cattle were carried during the 1951-52 season, rotational grazing being used where possible with the sheep grazing and the cattle being used as mowers to control roughage. Eighteen months after sowing both areas had an excellent sward of grasses and clovers and little weed invasion had occurred. Gorse regrowth and seedling growth, though not serious, appeared to some extent on the giant-disced area. Very little gorse was present on the ploughed block.

A maintenance phosphate application of 2½cwt. of reverted superphosphate per acre and a dressing of 1 ton of lime per acre were applied in March 1952.

**Fertiliser trials:** Manurial strips of phosphate, potash, and molybdenum, alone and in combination, were laid down on the young pasture. Responses to molybdenum were evident and more noticeable where it was used in the presence of phosphate. Responses to potash treatments have not been observed in this trial. This trial and others laid down on similar country indicate that responses to molybdenum may be small on newly sown pasture and on pastures which have previously been heavily limed.

### Deep Ploughing with Forage Cropping before Sowing

The remainder of the area developed in 1950 was deep ploughed (about 9 or 10in. deep), fallowed for 6 months, and cultivated for swedes and turnips. Swedes were ridged in 26in. rows on the gentler slopes and soft turnips were ridged on the steeper slopes. Twenty-five hundredweight of lime per acre was applied to the ground before sowing and 3cwt. of reverted superphosphate per acre sown with the brassica seed. During the 1950-51 season yields were affected by dry weather. After the swedes and turnips had been fed off in winter 1951 the area was disced and cultivated for new grass, which was sown early in February 1952 with 2½cwt. per acre of serpentine superphosphate. The following mixture was sown: Certified perennial ryegrass 1 bushel, Certified short-rotation ryegrass 10lb., Certified cocksfoot 6lb., Certified New Zealand white clover 3lb., Montgomery red clover 3lb., and crested dogstail 2lb. A good strike resulted and an excellent young grass sward is now present. The young pasture received a further dressing of 2cwt. of reverted superphosphate per acre in September 1952. Results from mowing trials on similar soil types at Invermay show conclusively the advantages of heavy initial phosphatic dressings of the order of 3 to 6cwt. per acre in the first year followed by annual maintenance dressings of 1 to 2cwt. per acre. The establishment of the new pasture on this deep-ploughed area was very good, but could not be directly compared with the shallow-ploughed area, as a forage crop was sown on the former but not on the latter.

## Steep or Stony Hill Country

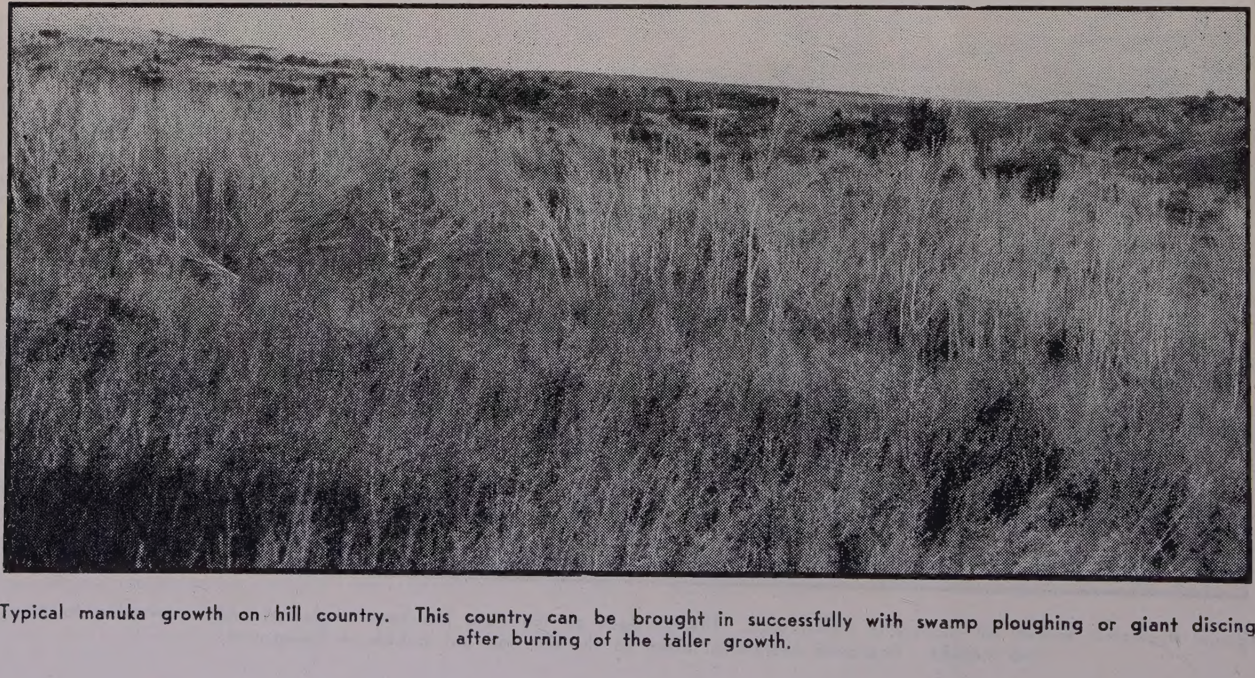
Following are details of the development of third-class hill country too steep or stony to be ploughed.

### Surface-sowing Trials with Grass and Clover

Six acres of surface-sowing trials were laid down in 1950, 5 plots each of 1 to 2 acres being sown. Plots were given the following treatments:—

1. Giant disced and surface sown during February 1951.

2. Giant disced and surface sown during October 1951.



Typical manuka growth on hill country. This country can be brought in successfully with swamp ploughing or giant discing after burning of the taller growth.

Hill ridges on newly sown pasture. Manuka and gorse are present in gullies and in background. A portion of the latter has been swamp ploughed.

3. Left uncultivated and surface sown during February 1951.

4. Left uncultivated and surface sown during October 1951.

5. Hay fed out to cattle on uncultivated ground in winter 1950 and 1951 and plot oversown during October 1951. Sixteen sub-plots were laid out across each main plot and on these eight seed mixtures were hand sown. These sub-plots were sown in duplicate.

Similar rates of grass species were sown with each mixture, the rates being as follows: Perennial ryegrass 10lb., cocksfoot 5lb., and crested dogstail 4lb. Different clover species were included in each mixture, the clover species including New Zealand Certified white clover, Kentish wild white clover, Mt. Barker and Tallarook subterranean clovers, New Zealand Certified Montgomery red clover, and *Lotus major* and *Lotus corniculatus.*

With the exception of eight sub-plots in No. 3 treatment, which received neither superphosphate nor lime, plots were sown with 25cwt. of lime and 3cwt. of superphosphate per acre. Observations on this trial area and preliminary results showed:—

The establishment of New Zealand Montgomery red clover and Certified New Zealand white clover was excellent on the disced area and surprisingly good even among the sod-bound browntop-native grass pasture, especially where superphosphate and lime had been applied at sowing. The establishment of the subterranean clovers both in February and October sowings was inferior to that from Montgomery and white clovers. The establishment of the *Lotus* species was very poor.

The establishment of the clover species was very poor in those plots receiving no lime or phosphate, and very few introduced clovers can be found in these plots.

The density of the cover appears to be important, as the best strike of clovers occurred where the grass cover was thin and short. Grazing before sowing may thus be advisable. As was expected, the best strike of grass and clover species occurred on the surface-cultivated plots. On many areas, however, even rough surface cultivation with giant discs is not possible.

The feeding out of clover hay resulted in a good strike of both grasses and clovers even without oversowing. This appears to be an excellent means of introducing legumes into clover-deficient hill country where cultivation is impossible.

From this trial it is evident that grazing management plays an important part in ensuring a successful establishment of clovers from oversowing. The area should be closely grazed before sowing and close grazing afterward should be avoided. Where possible the oversown area should be spelled periodically to allow the clovers to seed and become firmly established. This is of particular importance with subterranean clover, spelling of which is advisable during the flowering stage so that the plant can reseed. If the sown clover species are to thrive and persist for several years, regular topdressing with phosphatic fertilisers is essential. Aerial distribution of seeds and fertiliser seems destined to play an important role in the development of steep or stony third-class hill country.

## Improvement by Stock Management

The role of the grazing animal in developing and improving marginal hill country is an important one. At Invermay Research Station cattle are used in conjunction with rotational grazing by sheep to graze roughage and control certain weeds neglected by sheep.

A marked improvement has been effected on some of the unploughable hill country by using it as a run-off for stock, by sowing areas in swedes and turnips and break feeding them, and by feeding out hay and other supplementary feed on poor pastures in conjunction with oversowing and topdressing.

## Use of Hormone Weedkillers

Trials have been laid down with various formulations of hormone weedkillers on manuka, gorse, sweet brier, tutu, and tutsan. The best control has been obtained by spraying with a volatile formulation of 2, 4, 5-T during summer. At this time of year rates of 1 to 2lb. of acid equivalent per acre gave good control, but heavier rates were necessary at other times to give comparable results. Complete coverage of the brush plant is very important and from 80 to 200 gallons of water per acre were needed to obtain the necessary coverage, depending on the size and density of the plants.

For gorse control January spraying with 1.9lb. of acid equivalent of the volatile butyl ester of 2, 4, 5-T gave about a 90 per cent. kill on young gorse. After 2 years few viable gorse shoots were present and browntop.

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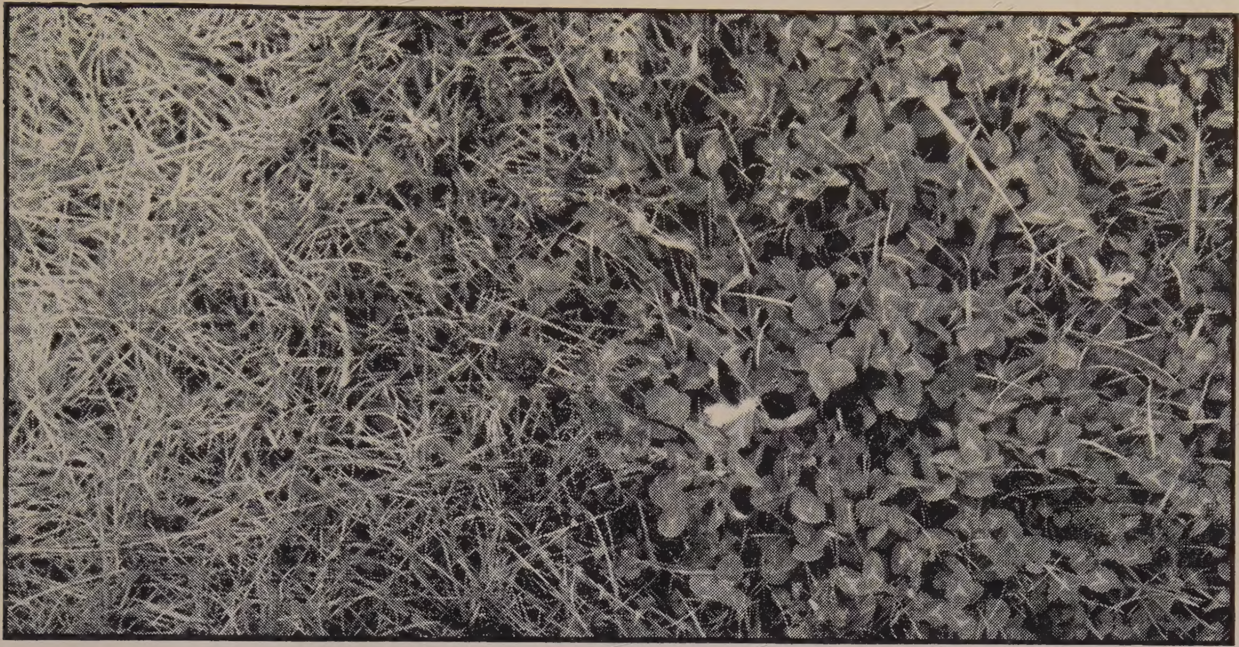


The benefit from lime and oversowing with clovers. The area at left was oversown with white and Montgomery red clovers, but received no lime; that at right was similarly oversown and was limed at 1 ton per acre.

sweet vernal, Yorkshire fog, and other grass species formed a dense association on what previously had been a mat of dense gorse 3 to 4ft. high. Burning of the sprayed foliage is not advisable, since regrowth and seedling growth are likely to occur.

Though the use of hormones on gorse and brush weeds is expensive at present, hormones are very useful in ridding unploughable country, fencelines, drains, and roadsides of gorse and brush weeds. The cost of the hormone materials is at present approximately £5 to £7 per gallon, from ½ to 1 gallon being required to spray an acre. In addition labour and equipment costs must be taken into account. These will depend on the acreage to be sprayed, the density of the gorse and its size, topography of and access to the area, equipment used, and labour and time involved.

## ECONOMICS AND COSTS

In any development programme financial considerations are important. The cost of developing marginal hill country is likely to vary considerably, depending on the nature of the country, the equipment and labour employed, and the efficiency of the operators, management, and organisation. Costs at Invermay Research Station may not be truly representative because of the small areas worked and the trials involved, but a brief outline of the approximate expense is presented to give some idea of the likely outlay in a programme of marginal-land development.

### Direct Regrassing Costs

The cost per acre of direct regrassing at Invermay is as follows:—

| | £ | s. | d. |
|---|---|---|---|
| Clearing, burning, dozing, and crushing before ploughing | 1 | 0 | 0 |
| Swamp ploughing using a 40 h.p. diesel tracklaying tractor | 2 | 5 | 0 |
| Discing (1 cut giant discs, 2 cuts tandem) | 1 | 7 | 0 |
| Heavy harrowing (3 times) | 1 | 4 | 0 |
| Light harrowing (twice) | | 14 | 0 |
| Sowing and harrowing | | 12 | 6 |
| Proportion repairs to tractor and equipment, and depreciation on them | 3 | 15 | 0 |
| Grass and clover seed (1 bushel perennial ryegrass, 10lb. short-rotation ryegrass, 5lb. cocksfoot, 3lb. Montgomery red clover, 3lb. white clover, 2lb. dogstail) | 3 | 10 | 0 |
| Superphosphate (3cwt. per acre) | 1 | 10 | 6 |
| Lime to Research Station (25cwt. per acre) | 1 | 11 | 0 |
| Cartage on superphosphate and lime from Research Station | 1 | 0 | 0 |
| | 18 | 9 | 0 |

To these direct costs should be added the costs of roading, drainage, subdivision, and shelter where it is necessary to provide these.

These costs are subject to wide variation in the individual items and should serve as a guide only. Initial costs may appear high, but will be largely recovered from a single good root or forage crop. The cost of developing marginal hill country is not likely to be much higher than that of ploughing and regrassing old pasture. By the ploughing and forage cropping of marginal hill country a greater portion of the improved pastures on the farm is available for grazing. This is especially important where the pastures are highly productive and where to grow swedes for winter feed it is necessary to plough up a highly productive pasture.

Furthermore, when the carrying capacity is increased as a result of developing hill country a portion of the increased revenue should be set against the costs of development. Thus, to assess costs it is necessary to balance both the short-term revenue from forage cropping and the long-term benefits from increased stocking against capital and maintenance costs of the development programme.

### Surface Sowing and Topdressing Costs

The costs of surface sowing and topdressing consist of seed and fertiliser costs plus the costs of distribution, labour and equipment, and repairs and depreciation. A mixture of 10lb. of perennial ryegrass, 5lb. of cocksfoot, 2lb. of crested dogstail, 3lb. of Montgomery red clover, and 3lb. of Certified New Zealand white clover costs approximately £2 15s. at present. The total costs per acre of spreading this mixture from the air with 3cwt. of reverted superphosphate would amount to approximately £4 15s. as follows:—

| | £ | s. | d. |
|---|---|---|---|
| Seed | 2 | 15 | 0 |
| 3cwt. of fertiliser | 1 | 8 | 6 |
| Costs of spreading (approximate) | | 9 | 0 |
| Sundry (cartage on fertiliser) | | 2 | 6 |
| | 4 | 15 | 0 |

If only the clover portion of the mixture is sown, costs would be reduced to approximately £3 4s. Sowing 2cwt. of superphosphate instead of 3cwt. would further reduce costs to approximately £2 11s. 6d.

## COMMITMENTS AND BENEFITS

If the development work described previously is used as an example, it will be realised that the improvement of marginal land involves a consideration of many factors, some of which are summarised below:—

### Debit Side

1. A heavy initial capital outlay is involved with little prospect of high monetary returns in the immediate future.

2. The use of heavy tracklaying tractors and heavy equipment is necessary with consequent high running and repair costs.

3. Heavy costs for seeds and fertiliser are liable to be incurred.

4. Labour requirements are increased.

5. Indirect expenditure may be required for roading, subdivision, water reticulation, and shelter.

6. Increased managerial and technical problems and responsibilities are involved consequent on the resultant increase in stock carrying capacity, the extension of the topdressing and liming programme, and the increased stock-management difficulties, cartage, material, and labour requirements.

7. Extra finance will be required for stock bought to exploit the increased carrying capacity brought about by land development.

### Credit Side

1. An increase in the capital value of the property and a long-term, overall increase in carrying capacity and production can be expected.

2. Provision for winter and supplementary feed can be made. New pasture will provide valuable feed at lambing time.

3. Gorse and other quick-spreading weeds can be controlled.

4. Tax concessions are available for most of this development work.

5. Full use can be made of existing resources of labour and capital which may otherwise be idle.

6. Reversion to scrub and gorse and deterioration by erosion are reduced or arrested. Formerly low-producing land is converted from an almost worthless state into a high-producing pasture and so aids in increasing national farm production.

## CONCLUSIONS

Large-scale operations by many farmers and the trial work in progress at Invermay Research Station carried out on a small scale have demonstrated that steep, marginal hill country of low fertility can be developed successfully. Where it is possible to cultivate the land this is the most economical course to adopt in the long run, as crop rotations can be fully utilised and care can be taken in the establishment of a good sward. Trials have proved that this marginal hill country can be ploughed and regrassed successfully without recourse to a rotation of forage crops.

The critical phase in developing hill country is the year after sowing, when a good establishment is very important. Too much or not enough grazing may so weaken the new sward that a good pasture is never obtained and the way is open for weed or grass-grub invasion.

The importance of sowing a suitable mixture of Certified grass and clover species and the necessity for applying initial and maintenance dressings of phosphates and lime are well recognised by many farmers. The importance of subsequent grazing management in the establishment of a new pasture is perhaps not so widely realised.

If pasture seed is sown with a cover crop, the sward may be weakened through competition for nutrients, light, and moisture; when a cover crop is fed off consideration cannot always be given to the young pasture and damage may occur as a result of overgrazing, trampling, and poaching. Where £15 to £20 per acre is spent on developing hill country, sowing of new grass alone after a fallow is likely to prove less expensive over a period than sowing with a cover crop, unless a very light seeding of the latter is used.

The folly of sowing cheap seed has been pointed out many times; if good strains are important on first-class land, how much more important are they on the less fertile hill soils, where inferior strains cannot compete with weeds and undesirable grass species?

### Cattle Essential

The importance of cattle on this country has already been stated. On much of the South Island hill country grazing is confined almost entirely to sheep, cattle being considered uneconomic and a nuisance in that they create problems in fence maintenance and general handling and management. However, cattle are essential for adequate control of roughage both on improved and unimproved hill pasture. Cattle should be looked on as mowing machines for the control of roughage rather than as growing beef.

Overgrazing of young hill pasture, particularly by close set stocking, can quickly spell doom to the high-producing sown species and result in rapid deterioration and reversion of the pasture. The management of young hill pasture involves the application of fertilisers, and where necessary, lime and trace elements, together with the diligent management of the grazing animal. Only where efficient use is made of all the various factors contributing toward the establishment and maintenance of high-producing pastures can full production and best results be obtained.

---

# Pedigree Sow Records

Contributed by the Animal Industry Division

In the period July 1952 to December 1952 the following breeders had litters recorded as shown:—

| Owner's name and address | Herd book number | | Number of pigs | | Litter weight | | Litter grade* |
|---|---|---|---|---|---|---|---|
| | Sow | Sire | Born | Weaned | 3 weeks lb. | 8 weeks lb. | |
| **Berkshire** | | | | | | | |
| Quinn, J. E., No. 1 R.D., Paeroa .. .. .. | 25273 | 24588 | 14 | 7 | 61 | 207 | — |
| Quinn, J. E., No. 1 R.D., Paeroa .. .. .. | 25274 | 24588 | 8 | 7 | 60 | 214 | — |
| Malaquin, F. W., Sect. No. 2 R.D., Whakatane .. | 26462 | 26256 | 10 | 9 | 120 | 408 | 1 |
| **Large White** | | | | | | | |
| Wood, A. E., c/o A. J. Evered, Sect. 3 R.D., Whakatane | 10035 | 9080 | 12 | 9 | 113 | 343 | 2 |
| Harper, R. J., Waiterimu R.D., Ohinemuri .. .. | 9903 | 9874 | 11 | 9 | 100 | 344 | 2 |
| Harper, R. J., Waiterimu R.D., Ohinemuri .. .. | 10340 | 9874 | 4 | 4 | 50 | 167 | — |
| Harper, R. J., Waiterimu R.D., Ohinemuri .. .. | 10341 | 10639 | 13 | 7 | 71 | 243 | 5 |

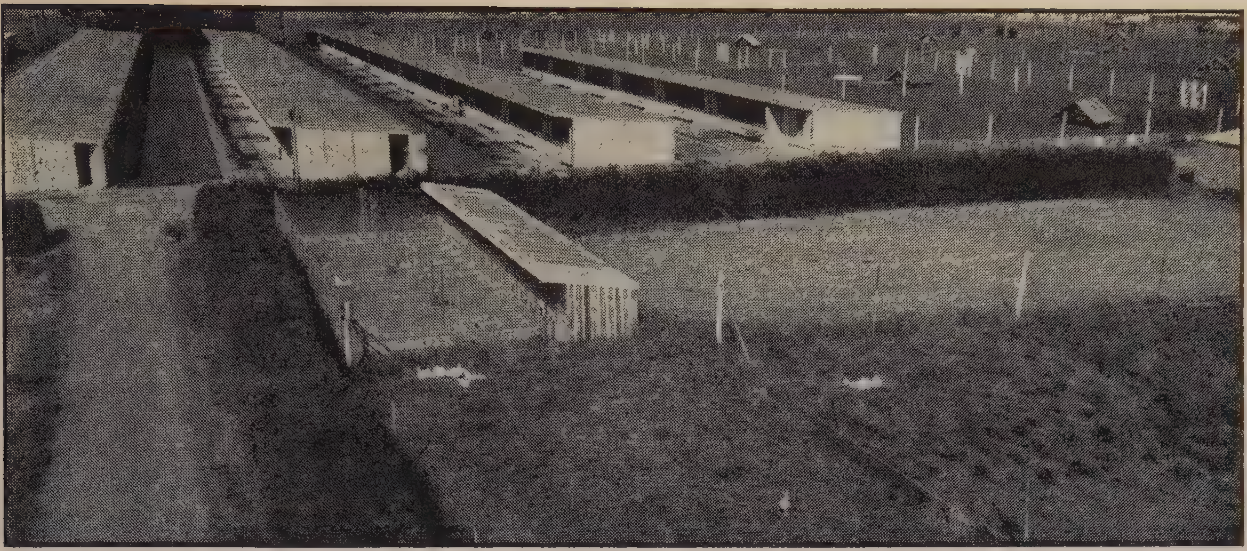
Minimum Litter Weight for Grades

| Grade* | 3 weeks (lb.) | 8 weeks (lb.) |
|---|---|---|
| 1 | 120 | 360 |
| 2 | 100 | 300 |
| 3 | 90 | 270 |
| 4 | 80 | 240 |
| 5 | 70 | 210 |

Breed Averages for the Period under Review

| Breed | Number of litters recorded | Number of pigs | | Litter weights | | Average weight per pig | |
|---|---|---|---|---|---|---|---|
| | | Born | Weaned | 3 weeks lb. | 8 weeks lb. | 3 weeks lb. | 8 weeks lb. |
| **Berkshire** .. | 3 | 10.3 | 7.6 | 80.3 | 276.3 | 9.72 | 34.78 |
| **Large White** .. | 4 | 10.0 | 7.25 | 83.5 | 274.25 | 11.25 | 38.2 |

* A No. 3 grade is classed as good, No. 2 excellent, and No. 1 as special.



# Importance of Protein in Poultry Rations

ALTHOUGH poultry producers are required to feed ready-mixed standard poultry mashes, there are certain ingredients which should be added and are accordingly under direct control by the producer. Among these are protein-rich foods. The quality and quantity of these foods have a marked effect on the efficiency of poultry rations for birds at all ages. Though poultry producers are becoming increasingly alive to this fact, there are still too many who have an insufficient knowledge of this subject. In this article F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington, reviews facts about feeding protein to poultry which should be known to all poultry producers. Some aspects of this subject are augmented by results from feeding trials carried out under the supervision of W. R. Belworthy at the Poultry Demonstration Plant, Upper Hutt.

IT is sufficient for a poultry farmer to know that protein is an essential of all animal life. In poultry it is an important constituent of feathers, skin, flesh (muscles), internal organs, and eggs. Birds require a constant supply of protein to produce growth or eggs and to repair worn tissues. As will be described later, the protein requirements of poultry vary according to the ages of birds and the purpose for which they are being kept. Careful investigations have been made into the best amounts of protein to feed at different ages and for production.

## Proteins and Protein-rich Foods

A protein-rich food is one that contains a comparatively high proportion or percentage of protein, such as meat meal, dried milk powder, and copra meal. Such foods are usually included in a mash only for their protein content.

Both protein and a protein-rich food have been described here because too many poultry farmers confuse the two. Asked how much protein is being fed to laying birds, a poultry farmer will reply 10 per cent., meaning 10 per cent. of meat meal (protein-rich food) in the mash. In point of fact the birds may be receiving a ration containing 14 per cent. of protein. Confusion arises between the amount of protein-rich food being included in a mash and the amount of protein the birds are getting from all the foods being fed. This confusion may well lead to inefficient feeding and inferior results.

It is essential to grasp that all poultry foods, whether of vegetable or animal origin, contain protein in varying quantities and of varying quality; the exceptions are any minerals added to a mash and the usual grits, such as oyster shell, fed to poultry. According to the quantity of proteins in the foods and the proportions in which they are fed so will the total intake of protein by birds vary. Consideration of the protein content of the poultry foods and combinations of these foods given below illustrates this point.

| Food | lb. protein in each 100lb. of food |
|---|---|
| Wheat or wheat meal .. | 12 |
| Pollard .. .. .. | 16 |
| Bran .. .. .. | 14 |
| Maize meal .. .. | 10 |
| Meat meal .. .. | 60 |
| Dried skimmed milk .. | 34 |
| Pea meal .. .. .. | 23 |

These examples are sufficient to illustrate the marked difference in the quantity of protein in foods commonly used for poultry. Wheat meal, pollard, bran, and maize contain a comparatively low level of vegetable protein and pea meal contains a comparatively high level. Meat meal and dried skimmed milk powder contain a high level of animal protein. The protein content of a mixture of these foods is ascertained as follows:—

100lb. of pollard contains 16lb. of protein, therefore 1lb. of pollard contains 0.16lb. of protein; 100lb. of wheat meal contains 12lb. of protein, therefore 1lb. of wheat meal contains 0.12lb. of protein; 100lb. of meat meal contains 60lb. of protein, therefore 1lb. of meat meal contains 0.60lb. of protein, etc. In assessing the protein in a mixture the calculation is as follows:—

| | | lb. protein |
|---|---|---|
| 25lb. pollard | = 25 × .16 = | 4.0 |
| 20lb. bran | = 20 × .14 = | 2.8 |
| 25lb. wheat meal | = 25 × .12 = | 3.0 |
| 20lb. maize | = 20 × .10 = | 2.0 |
| 10lb. meat meal | = 10 × .60 = | 6.0 |
| 100lb. mixture .. | .. .. = | 17.8 |

Although the mixture (mash) quoted contains only 10 per cent. of meat meal, it has a protein content of 17.8 per cent. It would be wrong to state that this mixture contains 10 per cent. of "protein", referring to the amount of meat meal included. It is obviously dangerous to confuse the protein content of a mash with the amount of protein-rich food, such as meat meal, included in that mash.

What counts is the amount of protein in the total ration fed to birds. Most New Zealand poultry producers feed both mash and grain, the two together constituting the ration fed.

### Calculating Protein Content

If it is assumed that a grain mixture of wheat and barley in equal proportions by weight is fed with the mash quoted, the amount of protein in 100lb. of the grain mixture is as follows:—

| | | lb. protein |
|---|---|---|
| 50lb. wheat | = 50 × .12 = | 6.0 |
| 50lb. barley | = 50 × .11 = | 5.5 |
| 100lb. | .. .. .. = | 11.5 |

# A Test Case of what Silage can do . . .

Winter Months
Milking Return

CATTLE:

Figures taken from a South Island farmer's 1949-1952 Milking Returns:—

| | No. of Cows | Average per Cow in gallons | Total gallons milk |
|---|---|---|---|
| 1949 | 87 | 218.1 | 18,963 |
| 1950 | 81 | 217.0 | 17,617 |
| 1951 | 64 | 277.7 | 17,773 |
| 1952 | 52 | 355.8 | 18,516 |

This was made possible by increasing the Silage ration per cow from nil to 50lbs. per day. Write for the full milk producing and feed chart.

**SHEEP:** The case for feeding Silage to sheep is set out in the new Canterbury Chamber of Commerce Bulletin entitled "Silage for Sheep".

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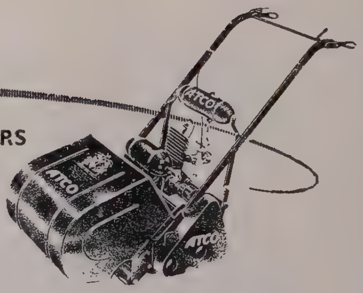

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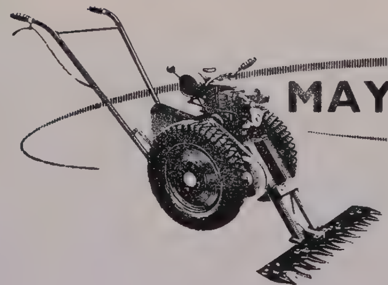

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In general practice poultry are fed equal parts of mash and grain, and the position is therefore as follows:—

| | lb. protein |
|---|---|
| 100lb. mash contains .. | 17.8 |
| 100lb. grain contains .. | 11.5 |
| 200lb. contains .. .. | 29.3 |
| 100lb. of the ration contains | 14.6 |

Accordingly in the example given if birds were receiving the ration described they would be getting 14.6 per cent. of protein. It is not satisfactory to quote the amount of meat meal or even the protein content of a mash.

**It is essential in efficient feeding to know the protein content of the total ration being given to poultry.**

## Quality of Protein Fed

It is a big step forward when a poultry producer is able to calculate fairly accurately the amount of protein being fed to birds. The next step is to appreciate that protein varies according to its origin in quality or efficiency as a feed. Coupled with this goes a knowledge of the relative values of protein-rich foods.

Both animal and vegetable protein have a value for feeding, but the former, which is required for satisfactory growth or production, is more valuable than the latter. A ration containing only vegetable protein is not satisfactory either for rearing or egg production. A combination of protein-rich foods of animal and vegetable origin can give very satisfactory results; in fact in certain instances combinations of animal and vegetable protein are more efficient than animal protein alone.

### Animal Protein

Animal protein from meat and fish meals is of greater value for feeding to poultry than the protein in blood meal. Blood meal has a very high protein content (80 per cent.), but is rarely used for poultry. The protein in milk powders is favoured for chick rearing, not only because of the riboflavin content of the milk, but because the protein is highly digestible.

Vegetable proteins generally are not as easily digested as animal protein. For that reason pea meal is not recommended for chick rations. On the other hand copra meal and pea meal in combination with an animal protein are satisfactory for egg production. Unfortunately extracted soya bran meal is not available in New Zealand, owing mainly to the fact that the freight charges which would be incurred in bringing the meal into New Zealand would make the price of this protein-rich food prohibitive. Extracted soya bran meal and milk powder form an efficient food combination for rearing, and the former plus fish or meat meal are an excellent combination for layers.

### Vegetable Protein

Apart from the fact that a mixture of animal and vegetable proteins can be an efficient form of protein feeding, vegetable proteins become of interest to poultry producers when they are cheaper than animal proteins or when supplies of animal proteins are short. Until the price of copra meal was increased recently this meal was an economic source of vegetable protein.

Under free-range conditions birds obtain insects, which add to their intake of protein.

However, New Zealand, like many other countries, is short of animal protein for stock feeding and the possibility of augmenting supplies of animal protein with available supplies of vegetable protein is becoming important. Up to the present New Zealand poultry producers have been required to pay only scant attention to the use of vegetable protein-rich foods. It might be true to add that there is a prejudice against such foods as copra and pea meals; lack of knowledge of the true value of these foods is the main cause of this prejudice.

### Price Comparisons

As protein-rich foods vary considerably in protein content (meat meal has 60 per cent. protein, meat and bone 45 per cent., milk powder 34 per cent., and pea meal 23 per cent.), it is necessary to compare the economic values of these foods. To attain any given level of protein in a mash greater quantities of meat and bone meal, copra meal (22 per cent. protein), or milk powder will have to be included than of meat meal. Since protein-rich foods are added to a poultry mash almost solely for their protein, it is justifiable for comparison purposes only to divide the value of 100lb. of any of the meals by the number of pounds of protein present, thus arriving at the value of 1lb. of protein. For example, if meat meal containing 60 per cent. of protein is worth £23 per ton and meat and bone meal with 45 per cent. of protein £20 5s. per ton, which is the better buy assuming that both are equal in other respects such as a fairly low oil content in each meal? How do they compare with copra meal containing 22 per cent. of protein at £32 per ton?

| | Protein per cent. | Price per ton £ s. | | d. per lb. protein |
|---|---|---|---|---|
| Meat meal .. .. | 60 | 23 | = | 4.1 |
| Meat and bone meal | 47 | 20 5 | = | 4.6 |
| *Copra meal .. | 22 | 32 | = | 14.7 |
| *Pea meal .. .. | 23 | 25 | = | 11.7 |

* Price quoted is for Wellington.

The figures show some remarkable differences in cost of protein in the foods named. Note the ½d. per pound advantage in buying a high-grade meat meal as against meat and bone meal. The recently increased price for copra meal places this food right out of line economically compared with meat meal. Only severe shortages of animal protein will make copra meal of value for feeding at the price quoted. The same applies to pea meal.

## Quantities of Protein Required

Poultry require varying protein levels in their food according to age and the purpose for which they are kept. A close study of this aspect of feeding has been made and certain optimum figures can be given to serve as a guide. It is necessary also to consider the class of protein-rich food (protein concentrate) which should be fed to birds of various ages. The recommendations for protein in the total ration (mash and grain, where both are being fed) for poultry are:—

| | Protein per cent. |
|---|---|
| Chickens, day old-8 weeks | 18-20 |
| Growing stock, 9-18 weeks | 13-15 |
| Laying stock .. .. | 16 |
| Breeding stock .. .. | 15 |

### Chickens

Because of their rapid growth of body and the development of feathers, young chickens require a high level of protein. Under average conditions in New Zealand, where many chickens are reared under intensive conditions or at most only have a limited outside run for a part of the rearing period, the young birds are dependent entirely, or almost entirely, upon the protein in the ration fed, there being little opportunity for obtaining insects. Accordingly at least 18 per cent. of protein should be available to birds during the first 2 months.

Quality is also important at this stage. High-grade meat meal and in addition milk powder (dried skimmed milk or buttermilk) are strongly recommended. Liver meal is another valuable protein concentrate for chicks and the meal if cheaper would be equally strongly recommended. Vegetable protein concentrates, even if available at an economic price, are not recommended.

**Growing Stock**

Birds of from 9 to 18 weeks are growing rapidly and at the same time continuously changing their feathers. Where practicable the change-over from the chick to the growing stage should be gradual, and a sudden drop in the protein content of the mash should be avoided. The aim should be to reduce the protein from 20 to 13.5 per cent. over a period of 2 or 3 weeks. Though milk powder may be used in the mash for the first week or two of the growing stage, it is not generally essential and at present prices is hardly economical for birds during this period. High-grade meat meal is satisfactory as a source of protein.

Opinions among poultry keepers as to the most satisfactory quantity of protein for growing stock vary. It is desirable for growing pullets to attain good body size before showing signs of developing sexual maturity (reddening up before laying). Despite the fact that world authorities on poultry husbandry state that the rate of sexual maturity is influenced mainly by breeding, many poultry producers feel that for growing birds a mash of comparatively high protein content will tend to race pullets into lay before they have acquired satisfactory body size. It would appear that in practice the rate of sexual maturity in pullets varies from season to season and further that early-hatched pullets as a whole mature more quickly than those hatched later. Consequently it is recommended that poultry producers use discretion and should adjust the protein level in the ration of growing birds according to how the birds are developing. Producers whose birds are maturing too rapidly should not cut down the birds' feed. Where pullets come into lay early they should be supplied with all the food they will take, as much will be required for both egg production and further body development.

**Laying Stock**

The optimum protein level in rations for laying birds is given as 16 per cent. It is not recommended that this level be exceeded where laying pullets are subsequently to be used for breeding as hens. Pullets not intended as future breeders, such as crossbred birds, can be fed at a higher level to stimulate heavy egg production, particularly during winter. It is not economical to use the more expensive protein-rich foods, such as milk powders, for straight egg production from pullets.

**Breeding Stock**

For breeding stock the protein level is lowered slightly, as it is not desirable to over-stimulate production at the risk of lowering the quality of the hatching egg. It is desirable to obtain the best-quality egg to ensure satisfactory hatching and to produce a quality chick. It is recommended therefore that milk powder be included in a breeders' mash at the rate of approximately 5 per cent. of dried skimmed milk.

## Free Meat Meal Feeding

Through circumstances associated with the supplies of meat meal available to the poultry industry, standard poultry mashes (chick mash No. 1 and laying mash No. 1) contain only 10 per cent. of meat meal. Therefore these mashes when fed in equal proportions with grain do not give protein levels over the complete ration in line with the optimum levels already recommended. Consequently poultry producers have been augmenting the protein in these mashes by adding extra meat meal and milk powder according to the class of stock.

If the supplements are added directly to the mash, labour and time have to be expended in remixing the mash. To avoid this additional work poultry producers have been feeding additional meat meal by placing it in separate troughs and allowing the birds to help themselves. Good results have been obtained by this method of feeding, but a number of producers have expressed interest in, and sometimes concern about, the quantity of meat meal consumed by laying birds when permitted access throughout the day to meat meal in this way.

**Feeding Trials**

The Department of Agriculture has made a study of this aspect of feeding in trials at the Poultry Demonstration Plant, Upper Hutt, and can now supply reliable figures likely to be of interest to poultry producers.

In February 1952, 50 Australorp x White Leghorn pullets were placed on a ration of dry mash, grain, and free meat meal. The mash was similar in formula to standard laying mash No. 2 and contained no meat meal or other protein-rich food. A careful check was made for 40 weeks during the laying season on the amount of grain fed to the birds and the quantities of dry mash and meat meal taken by the birds from hoppers which were open all day. The figures of food consumption for the 10 periods were as follows:—

| Period | Food consumed per bird daily<br>Grain | <br>Mash | <br>Meat meal | Per cent. crude protein in total ration | Average per cent. egg production per bird |
|---|---|---|---|---|---|
| | oz. | oz. | oz. | | |
| 1 (February) .. .. | 1.5 | 2.5 | .41 | 16.7 | 48.2 |
| 2 (March) .. .. | 1.7 | 2.4 | .46 | 17.1 | 43.0 |
| 3 (April) .. .. | 2.0 | 1.6 | .34 | 16.2 | 33.7 |
| 4 (May) .. .. | 2.1 | 1.8 | .28 | 15.4 | 24.5 |
| 5 (June) .. .. | 2.0 | 2.4 | .21 | 14.6 | 49.1 |
| 6 (July) .. .. | 2.0 | 2.3 | .27 | 15.1 | 44.7 |
| 7 (August) .. .. | 2.1 | 2.4 | .33 | 15.4 | 59.2 |
| 8 (September) .. .. | 2.3 | 2.5 | .28 | 15.1 | 67.7 |
| 9 (October) .. .. | 2.2 | 2.0 | .21 | 14.6 | 61.6 |
| 10 (November) .. .. | 2.2 | 2.2 | .31 | 15.5 | 62.5 |

The figures given in the table demonstrate clearly that birds consumed meat meal at a comparatively steady level throughout the 40 weeks. More important is that the total protein intake was fairly consistent month by month at a level around the optimum feeding level recommended for laying birds. In other words although these pullets had access at all times to a protein-rich food (meat meal), they maintained a balanced ration. There appears to be no relation between the amount of meat meal consumed and egg production, though the total food consumption fell during April and May, when production was low. Food consumption has been expressed in ounces of food consumed per day on an average for each period, as a daily consumption rate is more familiar to, and consequently more easily appreciated by, the average poultry producer.

Similar figures were recorded in trials conducted during 1951, when it was found that birds receiving free meat meal and a grain ration balanced their diet. Poultry producers who wish to use free meat meal with either a basic laying mash or a grain ration can do so with the knowledge that the birds will regulate the protein intake to an approximately correct level for egg production.

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# Agricultural and Pastoral Statistics 1952-53

SCIENTIFIC developments in sampling procedure during recent years in the statistical field have enabled the Government Statistician to modify his demands for statistics from the farming community to such an extent that this year only one farmer in every 7 or 8 will be asked to supply the usual annual statistical schedule.

The method of collection is also being amended in that those farmers who have been selected (according to the scientific method of sample selection) are required to complete the schedule and forward it by post to the Government Statistician, Wellington. This new method represents a substantial saving to the farming community as a whole and will result in a considerable saving of expenditure in collecting these statistics.

The sampling procedure adopted by the Census and Statistics Department provides for the stratification of farms according to broad area groups and a random selection of farms within these groups. The sampling fraction varies between the area groups so that only approximately 14 per cent. of farm holdings are included in the sample, but the area covered will be more than 60 per cent. of the total area of all farm holdings.

Present intentions are for the agricultural and pastoral statistics to be collected on a sample basis for 4 years, and in each fifth year a complete collection will be made, preferably by personal canvass.

The Government Statistician is relying on the farming community for co-operation in this changed procedure, and up-to-date statistics can result only if there is a speedy response from individual farmers included in the sample.

Some loss of regional detail particularly of small crops will result from the adoption of the sampling procedure, but major crops, livestock, and other important farming characteristics will be available in the same detail as hitherto.

◆

# Faulty Threshing of Peas Must be Avoided

DURING the war and in the immediate post-war years New Zealand exported her surplus peas on a sellers' market to overseas buyers, who were pleased to accept anything. Today, however, the position overseas has changed; competitors are in the field and New Zealand is selling on a buyers' market. That all is not well on this market is indicated by a demand from overseas buyers for a better all-round sample. Complaints have been received on the quality of export Partridge (Maple) peas—complaints caused by the inclusion in the samples of thistle heads, small clods of earth, pods, broken and small peas, and weed seeds. It cannot be emphasised too strongly that in recent years the quality of the header-dressed sample of peas has deteriorated to the extent that if the situation is not immediately corrected, some radical changes must occur in the handling and sale of the national pea crop. In this article C. J. Crosbie, Machinery Instructor, Department of Agriculture, Christchurch, discusses economic aspects of harvesting the crop and provides information on the practical side of threshing it—information based on practices that ensure a good, sound line of clean peas.

[*Downie Studios photo.*

Picking up and threshing a crop of peas after it has been cut and windrowed with a mower.

AS the ultimate object of the grower is to sell the peas he harvests, a brief review of the trend in New Zealand's export trade in peas will present the problem in its correct perspective.

## The Export Trade

The table below shows that the export value of all peas, field and garden, has been approximately £1,000,000 annually.

In 1950, after 4 seasons of increasing exports, New Zealand exported 325,287 centals (equivalent to 542,145 bushels) of food and Partridge peas with a declared export value of £439,437. In 1951 the exported quantity of these peas fell to 159,744 centals (266,240 bushels) with a declared value of £266,375.

If, because of continued receipt of inferior header-dressed lines, it becomes necessary for merchants to machine dress all lines of Partridge and food peas before they are acceptable to overseas buyers, the cost of this operation can be calculated as about 2s. 6d. per bushel when broken railage, in-and-out handling charges, machine dressing, loss in weight, sack charges, and so on are taken into account. Thus for the 1950 crop the cost of machine dressing the exportable surplus of 542,145 bushels of Partridge peas at 2s. 6d. per bushel would have approximated £68,000. The pea growers of New Zealand are faced with the proposition of losing this amount, or, expressed differently, £3 to £4 per acre, from the proceeds of their harvest unless more care is taken in the field to produce a better header-dressed sample. This is too great a sum to lose when by exercising better supervision of their men and machines growers can obtain a vastly improved sample.

## Harvesting Charges

In the 1951-52 harvest the contract rate for threshing peas was 1s. 6d. per bushel with a minimum charge of 54s. per hour, and many inferior lines were harvested at this rate. If it is assumed that in future inferior lines will be machine dressed, the cost to the grower for harvesting the crop will be not 1s. 6d. but 4s. per bushel. It will thus be readily appreciated that in future a grower could pay up to 2s. per bushel to ensure a No. 1 sample off the header and still show a handsome profit. It will pay him to ensure that the machine is not driven so fast that it is unable to make a good, clean sample and to ensure that the header settings are such that a sample of export quality is obtained. Only in this way will he avoid the loss of an overseas market or the alternative of a heavy machine-dressing charge on top of his harvesting cost.

These considerations make it evident that from any angle it will be financially sound for a grower to exercise more care in harvesting his pea crop and that it would be ruinous to the industry to continue to send in inferior lines containing so much rubbish that overseas buyers are objecting to them.

If all Partridge peas have to be machine dressed before export, there is also the risk of loss of a market owing to delay in dressing due to congestion in the seed stores, and this loss can well be reflected in the price paid to the farmer the following season. Seed stores are already congested with seeds of all kinds, and to machine dress all Partridge peas would inevitably lead to further delays in dressing generally. When peas are threshed so that a No. 1 sample is obtained from the header they can go direct to the port from the country and so avoid any risk of delay in a seed store.

It should be noted, too, that dressing charges are based on "weight in" to the store, and when dirty lines are being dressed the farmer is being charged on material that is worthless when it has been dressed from the sample. One line of peas dressed last year contained over 1 ton of dirt and rubbish on which the farmer paid a dressing charge as well as transport charges.

**PEAS EXPORTED FROM NEW ZEALAND**

| Year | All kinds | | Food | | Partridge (Maple) | | Garden | |
|---|---|---|---|---|---|---|---|---|
| | Centals | Value £N.Z. | Centals | Value £N.Z. | Centals | Value £N.Z. | Centals | Value £N.Z. |
| 1947 .. | 401,059 | 873,944 | 83,386 | 156,414 | 138,804 | 203,038 | 168,869 | 514,492 |
| 1948 .. | 459,721 | 1,022,068 | 96,817 | 181,291 | 157,218 | 251,935 | 205,686 | 588,842 |
| 1949 .. | 508,984 | 1,004,540 | 99,361 | 163,502 | 236,714 | 332,448 | 172,909 | 508,590 |
| 1950 .. | 544,613 | 873,953 | 56,248 | 87,643 | 269,039 | 351,794 | 169,326 | 434,516 |
| 1951 .. | 302,918 | 572,655 | 28,382 | 44,086 | 131,362 | 222,289 | 143,174 | 306,280 |

Values shown represent the declared f.o.b. values at the ports of shipment.

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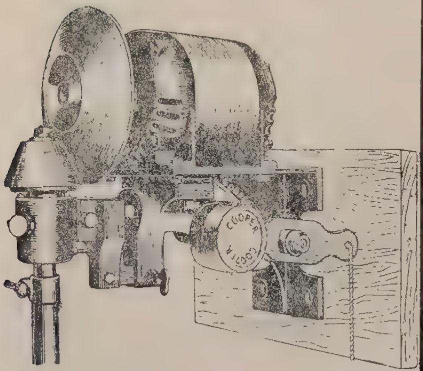

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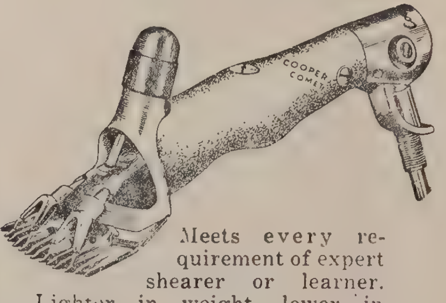

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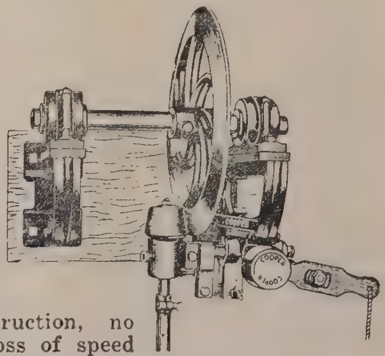

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[*Green and Hahn Photography Ltd. photo.*

This field of garden peas has been sprayed with a light application of M.C.P. for the control of Californian thistle. The centre portion, infested with thistle, is an unsprayed control strip.

## Harvesting

Comments so far refer particularly to Partridge peas, but a similar state of affairs applies frequently to other field peas. Even with garden types, which are always machine dressed before sale, proper attention to handling in the field will make a better sample which can be handled with less loss later.

The practices recommended for handling field peas (including Partridge, Blue Prussian, and other blue and white field peas) differ from those recommended for garden varieties, and are therefore dealt with separately.

### Harvesting Garden Peas

Unquestionably the best way of harvesting garden peas is to windrow them with the mower and to pick up the crop for threshing. Some growers direct head garden peas, but this is not generally recommended because of bleaching and loss in weight of the peas that occur. Particularly is direct heading not recommended if the crop is very weedy.

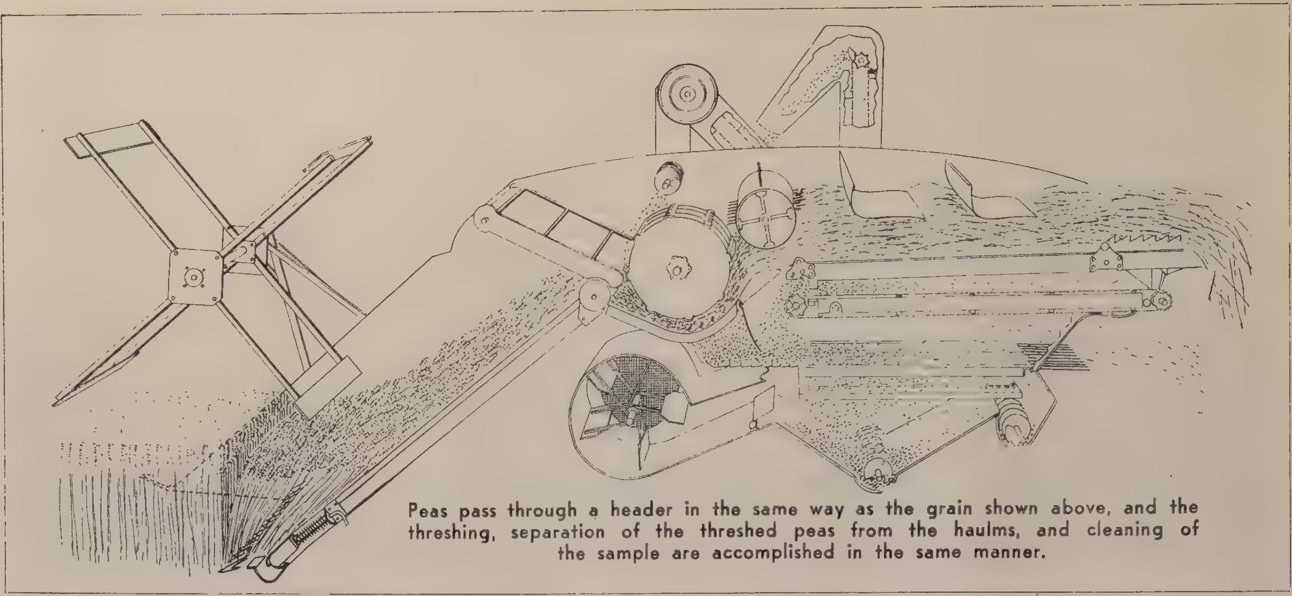
**Time of windrowing:** Garden peas should be windrowed while the peas in the pod are still on the green side. The mower should be started in the field when most of the pods are completely full and are just starting to change colour. In this way a better colour is obtained in the sample and a heavier weight is retained in the pea. If the crop is cut when on the green side, the pea vines settle on the ground and the risk of blowing in heavy winds is reduced.

**The weed problem** is ever present with the pea crop and unless special measures are taken to combat it, problems in harvesting a dirty crop inevitably arise. Most pea crops are harrowed in the early stages of growth to reduce weed growth, but such weeds as Californian thistle are not controlled in this way and when they are present they reduce the yield and delay maturity of the peas in the affected patches. Unless extreme care is taken, thistle heads are often numerous in the sample. Fat-hen and willow weed, because of their sappy nature, will stop direct heading of the pea crop. Presence of weeds in the crop generally sets up conditions that necessitate the header drum being tightened up and its speed increased to thresh the crop, and this inevitably results in split peas in the sample.

**Remedy for weeds:** Apart from their influence on crop yield, weeds are so troublesome in the harvesting of peas that special means are warranted for their control. In recent years low-volume spraying has opened up a new field in weed control, and the pea crop has received special investigation and study. D.N.O.C. and D.N.S.B.P. sprays have made possible cheap and efficient control of most of the common weeds in pea crops. The judicious use of low

[*Green and Hahn Photography Ltd. photo.*

Fat-hen, one of the worst weeds in peas, is easily controlled by spraying with D.N.O.C. or D.N.S.B.P. The dinitro sprays control most weeds in peas with little or no damage to the crop.



Peas pass through a header in the same way as the grain shown above, and the threshing, separation of the threshed peas from the haulms, and cleaning of the sample are accomplished in the same manner.

rates of application of M.C.P. under suitable conditions will control Californian thistle, one of the worst weeds in peas.

Low-volume application of the dinitro weedicides will control nightshade, which is the worst weed in peas, as its seed is the same size as the threshed peas and goes right through the header into the sample with the peas. The nightshade berries are never dry at harvest time and invariably quite a number of them are pulped when passing through the drum, so that they stain the peas and wet the whole sample. Peas threshed from a field infested with nightshade have been known to set in a solid block in the sack through wetting and staining.

**Threshing Garden Peas**

The first essential in efficient threshing of garden peas is to pick a warm, dry day, as it is false economy to attempt to thresh on dull, damp days or too soon after rain. It is wise not to start too early in the morning when traces of dew are still about, or to work too late in the evening when the crop starts to reabsorb moisture. Too early starting after rain is unwise because of difficult threshing conditions and also because of the higher moisture content of the peas. It may be necessary to alter the header settings two or three times a day to suit the altering conditions. Peas are tougher in the morning than in the afternoon, when they crack more readily if threshed with the header settings which were used earlier in the day.

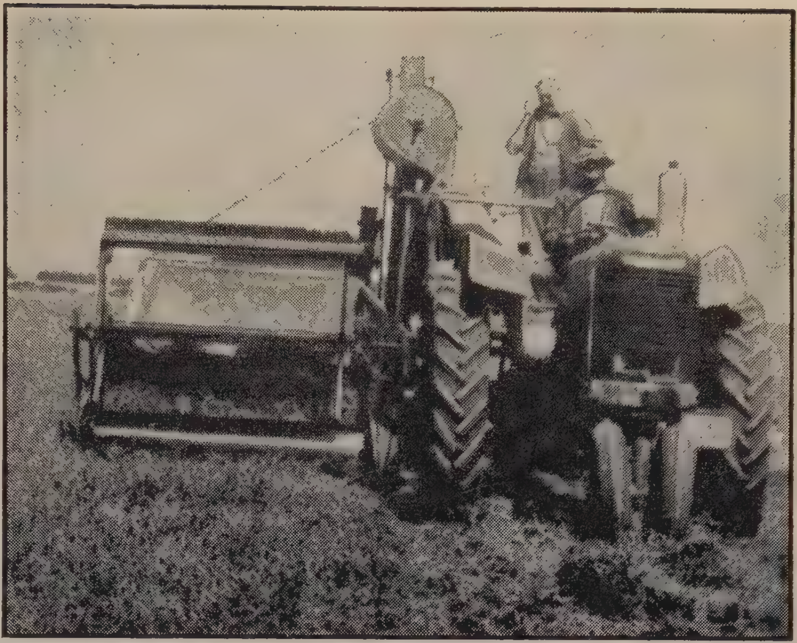
**The header settings:** The accompanying table of header settings for threshing peas with the various machines on the New Zealand market is in accordance with the various header manufacturers' recommendations as a guide for starting up in a field. The actual settings at which the crop will be threshed, however, are determined not by the chart but by the sample at the bagging spout. The manufacturers' recommendations are only a guide in starting up the machine. If a sample is examined at the spout, it is possible, if the sample is not No. 1 grade, to deduce from its appearance what header settings are at fault (see section "Main Faults in Samples" on the next page).

**HEADER SETTINGS FOR THRESHING PEAS**
**(For Use under Normal Average Conditions)**

| Make and model | Drum speed R.P.M. | Clearances |  | Blast adjustment | Fixed riddle in. | Concave notes |
|---|---|---|---|---|---|---|
|  |  | Shelling plate in. | Concave in. |  |  |  |
| Allis Chalmers Model 60 .. | 850-1000 | ⅜-¾ | ⅜-¾ | 2/3 open to fully open | 7/16-½ round | — |
| Case M.2 .. .. .. .. | 490-500 F<br>247-350 G | — | ¼-⅝ | 2/3 open to fully open | — | 1 concave bar |
| Case A .. .. .. .. | 500 F<br>310 G | — | ¼-⅝ | 2/3 open to fully open | — | — |
| Case SP.9 .. .. .. ..<br>Case SP.12 .. .. .. .. | 500 F<br>310 G | — | ¼-⅝ | 2/3 open to fully open | — | — |
| John Deere 12.A .. .. .. | 700-250 | ½-⅝ | ½-⅝ | Fully open | 9/16 round | — |
| Massey Harris 15 .. .. .. | 400-560 | — | ⅝ front<br>3/16 rear | Fully open | 7/16-⅝ round | Wires out |
| Massey Harris Clipper .. .. | 500 | — | ¾ front<br>¼-⅜ rear | Fully open | ⅜-½ round | 3 concave bars |
| Massey Harris 26<br>Massey Harris 726 | 460 | — | ⅝ front<br>3/16 rear | Fully open | 7/16-⅝ round | Wires out |
| McCormick-Deering 42 .. ..<br>McCormick-Deering 52 .. .. | 400-500 G<br>400-600 F | ⅜-⅝ G<br>½-⅝ F | 5/16-½ G<br>5/16-¾ F | 2/3 open to fully open | ⅜ round | 1-2 concave bars |
| McCormick-Deering 62 .. .. | 400-500 G<br>400-600 F | —<br>— | 5/16-½ G<br>5/16-¾ F | 2/3 open to fully open | ⅜ round | — |
| McCormick-Deering 64 .. .. | 400-500 G<br>400-600 F | —<br>— | 5/16-½ G<br>5/16-¾ F | 2/3 open to fully open | 7/16 round | 1-2 concave bars |
| McCormick-Deering 125.SP ..<br>McCormick-Deering 125.SPC .. | 400 or 650 G<br>400 or 650 F | —<br>— | 5/16-½ G<br>5/16-¾ F | 2/3 open to fully open | ⅜ round | — |

**Note**—G = garden peas; F = field peas.

These header settings are meant only as a guide in starting up a machine in the field. The actual settings used will be based on an examination of the sample at the bagging spout.



A crop of peas being direct headed without previous windrowing.

Experience and conditions on the day of threshing will determine the settings to be used. Under good threshing conditions the peas will fall out; under poor conditions they will have to be knocked out. In general, peas should be threshed with the minimum drum speed and the concave open as far as will cleanly thresh the crop. In this way cracked and split peas are avoided.

It is wise to keep the riddles open in the endeavour to have the peas go through and into the bag with one passage over the riddles. If rubbish is going through the riddles and into the bag, the blast should be opened up to float it off. The blast should be as fully open as possible without blowing the peas over the back of the machine. Peas are one of the heaviest seeds threshed and they will stand a lot of draught without being blown over the end of the machine. The draught controls rubbish that is lighter and smaller than the peas and will float it off. The opening of the riddles controls rubbish which is larger than the peas and passes over the riddles; material that is heavier but smaller than the peas is removed in the screen before the peas are bagged off. All machines have at least one adjustable riddle and some have two, and most manufacturers provide a fixed riddle for the final cleaning of the sample. This fixed riddle is available in a range of sizes, so that if the one supplied with the machine does not suit the particular crop being handled, others either larger or smaller are available in quite a good range of sizes.

If the header has been fitted with an English wire screen, a very large range of adjustments is available for removing material which is smaller and heavier than the peas, for removing undergrade peas, and for sorting out cracked or split peas. A range of cylinder screens is available for machines fitted with Hart Scour screens, so that one of a suitable size can be obtained if the one supplied with the machine is not suitable. Unfortunately, a number of headers of one make have been distributed to farmers without a screen of any sort, and it will obviously be impossible to make a No. 1 sample with such machines.

### Harvesting Field Peas

Field peas are generally direct headed either by lifting the crop with pea lifters and using the header cutter bar to mow the crop or by following directly behind the mower with a header fitted with a pick-up attachment. However, when direct heading with pea lifters is being done there is a tendency for more dirt to get in the sample, and if the field is stony, there is danger of picking up a stone and damaging the header. One stone so picked up caused damage costing £150 to repair, a sum that would buy many mower knives. The usual practice is to cut in front of the header with a mower.

**Time of cutting and threshing:** Field peas should not be cut before they are **hard in the pod.** The pods and vines should be brown and dried up, and if rubbed in the hand, should break up. The maximum permissible moisture content in the peas is 16 per cent. The choice of the day for threshing is important, for unless spraying has been carried out, green weeds will generally be present, and dry threshing conditions are needed for handling such a crop.

### Threshing the Crop

If the field is stony or cloddy or the crop thin, it is best to mow and pick up directly behind the mower. If the crop is cut and left, it will not settle on the ground and there is danger of its blowing if a wind should rise. If the crop is to be direct headed with pea lifters, fields with stones or clods should be avoided. The object is to lift the peas so that the header cutter bar can be run clear of the ground, and for this efficient pea lifters are necessary.

**Header settings:** As with garden peas, the manufacturers' recommendations will be used to start the header in the field, but the condition of the sample at the spout will determine the settings used in the field. Field peas are slightly smaller than garden peas, and a smaller fixed riddle may be used in the shaker box than that used for the garden varieties.

Field peas split and crack more easily than garden peas, and lower drum speed and more gentle treatment are necessary. At the time of harvest field peas are slightly drier than garden varieties, but because of the weed content of the crop the inclination is to thresh them a little harder than the garden varieties with the result that damaged peas appear in the sample. Some special care will be necessary when green weeds are present in the crop.

**Weed problems:** If there has been a dry summer and autumn during the ripening of the crop, there will be no great weed problem, but if conditions in the autumn have been favourable for growth, weeds will be troublesome. The aim in such weedy crops is to thresh as lightly as possible. Hard threshing bruises the green weed herbage and the peas pick up the juice to increase their moisture content and become an unfavourable colour. Further, broken weed material due to hard threshing will stick to the peas and cannot be removed in the cleaning mechanism of the header, and a dirty sample results.

## Main Faults in Samples

The main objection by overseas buyers to present New Zealand Partridge pea samples is centred on five main faults—earth in the sample, cracked or split peas, rubbish in the sample, small undeveloped peas (seconds), and thistle heads in the sample. These five faults can all be recognised at the bagging spout of the header and if action is taken, can be minimised if not eliminated.

### Earth

Earth in the sample is invariably caused by having the header pick-up too close to the ground or running too fast, so that clods are picked up with the swath. These clods are broken up by the action of the drum and pulverised. The machine can separate out all particles except those of the same size and weight as the peas and, under dirty conditions, these pieces of earth can be so numerous as to represent an undue proportion of the sample.

The pick-up fingers should barely touch the ground, and if the crop is heavy, they can be as much as 2 or 3in. above the ground and still work efficiently. If the crop is short and virtually only pods, there will be difficulty in obtaining a clean pick-up. The tendency under such conditions will be to press the pick-up hard down on the ground, but this is not recommended for the reasons already given. When a short crop is being cut it is wise to use a double swath board on the

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mower and drag the swath in tight so that it can be picked up. In heavier crops two swath boards are used, but the crop is not dragged in so tightly.

**Cracked or Split Peas**

In general less trouble will be experienced with cracking in garden peas than in the field varieties.

To reduce cracking the following steps are recommended:—

1. The best way (and also the easiest on many machines) is to slow down the drum speed. Opening the concave setting or, in some machines, removing a concave bar will also have the same effect, but a reduction of drum speed is most important.
2. The header may be travelling so fast that to handle the increased throughput the drum has to be speeded up to prevent its blocking; this is caused by the operator aiming for too high an output. A reduction in ground speed and drum speed will have the desired effect.
3. If because of adverse weather the peas have been in the field a long time and have been subject to sudden drying out, they will be over-mature and very brittle. Such peas need very careful and gentle treatment with a wide and slow drum.
4. If the return to the drum is too great, cracked and split peas will invariably result, because in some machines it is impossible to route them so that they bypass the drum and are not threshed again. In such cases the adjustable riddles should be opened wider to allow the peas through them and, if rubbish then gets into the sample, the blast should be opened a little more to float the rubbish over the riddles. The aim should be as many firsts as possible into the bag the first time over the riddles.

**Rubbish**

If pods, straw, thistle heads, or any other things bigger and lighter than the peas are present in the sample, there is faulty adjustment of the riddles and blast. Riddles wide open and poor blast result in these impurities, poor blast perhaps being the most common cause.

*[Standish and Preece photo.*

Left—A header-dressed sample of partridge peas harvested last season which was put through a header again to prove that the machine was capable of much improved work. The resulting sample, shown on the right, was classed as No. 1 by a port grader.

It is not generally recognised that when peas are being threshed the blast on any machine, whatever its make, can be two-thirds open to fully open without blowing peas over the back. More peas go over the back of headers in the mat of rubbish on the riddle owing to insufficient blast than are blown over by too much blast.

**Small Peas**

Presence of small peas and weed seeds such as wild oats and tares in the sample indicates that correct separation is not taking place in the screen before the sample is bagged off. These impurities are smaller than the peas and go through the riddles, yet are heavy enough not to be removed by the blast, so that they must be separated out in the screen. If the machine is fitted with an adjustable English wire screen, no trouble should be experienced in obtaining a setting that will give the desired result. Some operators tie the first few wires of the screen together, so that they do not expand, and obtain weed separation through the wider spaces between the remaining wires. If a Hart Scour screen is fitted, it may be necessary to obtain another cylinder screen of bigger size before the correct separation can be achieved. Most distributors stock a good range of screen sizes.

**Thistle Heads**

There is no doubt that the hardest impurity in a pea sample to remove is the undeveloped Californian thistle head. These heads are green, heavy, and about the same size as the peas, so that separation is difficult. Undoubtedly the best way to prevent them occurring in the sample is to spray the Californian thistle plants in the crop in the early stages of growth with a low rate of M.C.P. when growing conditions are favourable. However, there is no reason why large thistle heads should occur in the sample, for they are big enough to separate out on top of the first adjustable riddle and pass over the back of the machine.

The use of an extension adjustable riddle on the tail of the top riddle or a thistle plate in place of the usual wire fingers on some headers will do much to remove thistle heads of intermediate size, and this practice is recommended if thistles are present in quantity in the field. Distributors of such headers will have the riddle extensions in stock as extras.

## No. 1 Samples Essential

It is recognised that under adverse harvest conditions it is not always possible to bag off a No. 1 sample of peas, but it is felt that peas are the easiest and simplest crop to thresh and harvest efficiently so that a sample acceptable to any buyer is obtained. No great experience is needed by the operator to obtain such a sample, and provided he sets the machine according to the sample at the bagging spout and operates the machine intelligently and with changed settings to suit changing conditions, no difficulty should be experienced. The aim in harvesting must be the obtaining of a No. 1 sample each time the header is used if radical changes in the handling and sale of the Partridge pea crop are to be averted. Only in this way can the farmer avoid adding considerably to the costs of marketing his crop.

* * *

*[Standish and Preece photo.*

The sample on the left shows pea pods, thistle heads, stalks, seed coats, and vegetative matter taken out of the original sample on the top riddle with the aid of the blast, and the split and broken peas, small peas, and wild oats shown on the right were removed in the header screen.

# Smooth Granulation in Honey

THE keeping quality of honey is governed largely by the care taken by beekeepers during extracting and general atmospheric conditions such as temperature and humidity before consumption. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, explains how a beekeeper supplying the local market can improve the quality of his honey to meet the standard expected by consumers.

HONEY can be marketed in the comb, as a liquid, or granulated, but the bulk of the honey produced in New Zealand is sold in granulated form.

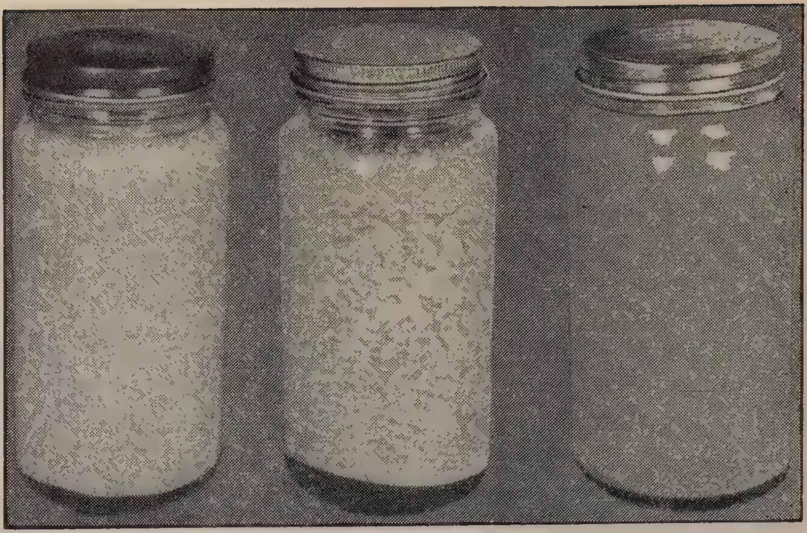
Honey is a food and therefore comes under the Food and Drug Regulations, administered by the Health Department, which clearly state that it must not have any substance added to it. It is surprising, however, the number of people who imagine that the whiteness of some New Zealand honey, particularly pure samples produced from white clover or from rata, is obtained by adding icing sugar or lard, and that some added substance is used to produce the desirable smooth grain in honey. To beekeepers this is ludicrous, as nothing of the kind takes place.

Honey varies greatly in flavour and colour according to the floral sources from which it is gathered, and its general condition is affected by temperature and atmospheric conditions. A honey may granulate into a very smooth-textured honey or it may granulate with objectionable coarse crystals, according to the source and conditions under which it is produced. Beekeepers who wish to place honey on the market in the most attractive form cannot therefore take the risk of this uncertainty of granulation. Control should be taken by beekeepers right from the start of the process, and if the recognised practice of granulating honey is carefully carried out, standard quality should be produced from year to year.

## Principles of Smooth Granulation

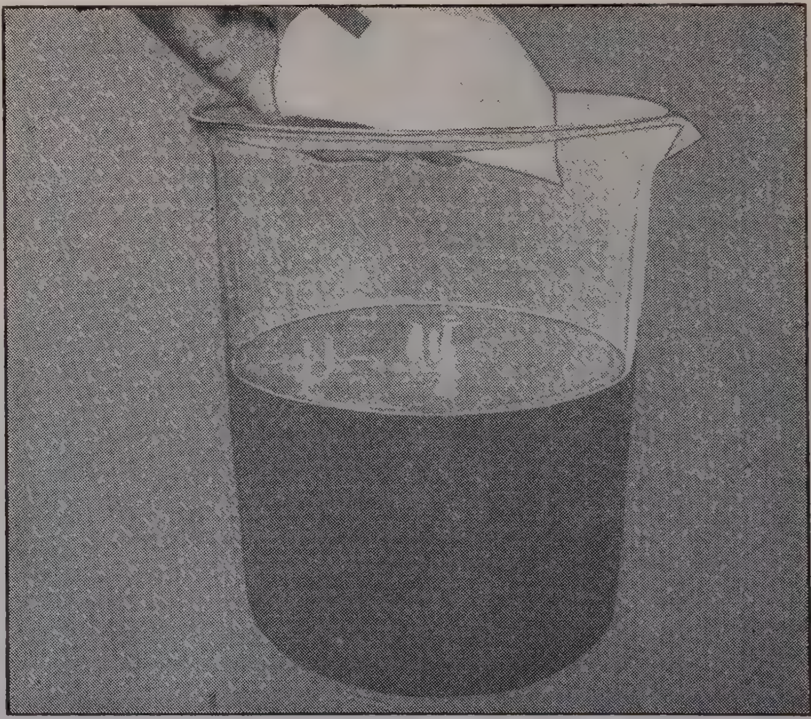
Honey that does not granulate quickly will generally become sugary or coarse grained. Similarly honey that has been heated and melted into liquid condition will, after several months, usually begin to re-granulate with coarse crystals if something is not done to overcome that condition. The method of obtaining smooth-grained honey by adding a starter is very simple provided certain important points are carefully watched.

The granulating process should begin as soon as the honey has had sufficient time to settle in the honey tanks. Once coarse granulation has begun the addition of a starter does not have the desired effect. The only thing to do then is to bring the honey up to a temperature of about 140 degrees F. to melt any coarse grains before adding the starter. At right is shown liquid honey which has just been extracted and sufficient time allowed for satisfactory skimming of any fine wax particles from the surface.

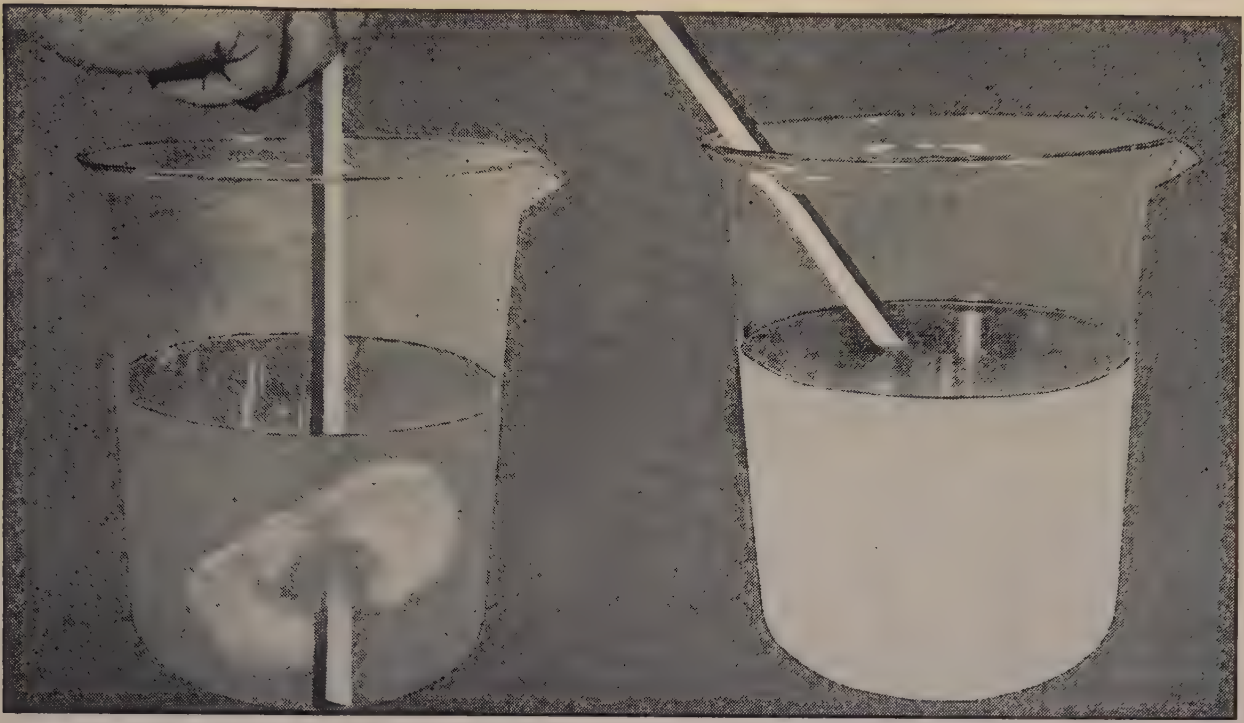


Three conditions of honey. Left—With smooth grain. Centre—With coarse grain. Right—Liquid honey. If left for several months, this will granulate like the honey in the centre jar.

The most important part of the process is the addition of a small amount of fine-grained or starter honey to the liquid bulk. Usually about 5 per cent. or more is added if plenty of starter honey is available. The illustration below shows about 4oz. of starter being added to 5lb. of liquid honey. It is illegal to add any other substance to honey; all starter must therefore be honey that has been selected and kept for its smooth, grainless qualities. Most commercial beekeepers maintain a constant supply of starter honey, and it can sometimes be built up by procuring supplies from beekeepers who are located in areas where quick-granulating honey of smooth grain is produced. Beekeepers with only a few hives may be able to secure suitable honey for this purpose from the local store. The Apiary Instructor for the



Liquid honey skimmed of fine wax particles and ready for granulating. Fine-grained starter is being placed in the honey. The proportion of starter generally used is approximately 5 per cent., and here 4oz. of starter are being used for 5lb. of honey. The temperature of the honey should be about 75 degrees F.



Left—Stirring process. Right—The starter has now been completely incorporated into the honey. For the next few days the temperature of the honey should be kept at about 57 degrees F.

district will be able to advise on the suitability of any honey for starter purposes.

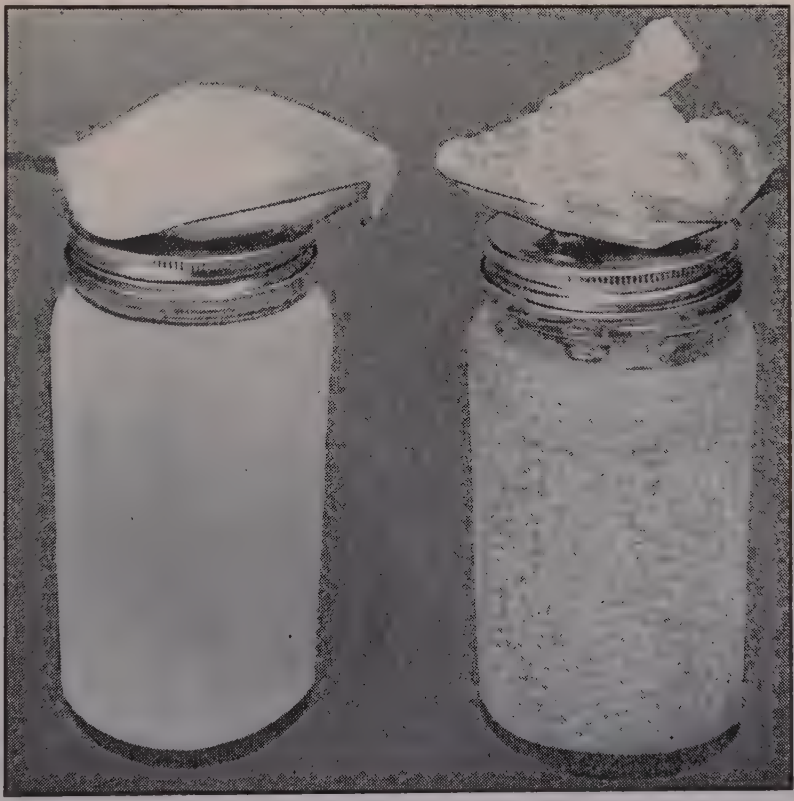
Before the correct proportion of starter is added to honey that has been heated a check should be made on the temperature of the liquid honey. If this is too warm, much of the fine-grained starter is melted and the desired rapid granulation is not attained. If the temperature is too low, some difficulty is experienced in getting a satisfactory mix of the two honeys. The temperature should be approximately 75 degrees F.

## Stirring Process

For stirring small lots a stick or paddle may be used, but for larger quantities some mechanical method is desirable which not only takes the hard work out of the job but gives a much better mix and more even texture to the honey. Stirring should be done in the honey and care taken not to cause excessive air bubbles. As honey will readily absorb moisture, the processing of honey for smooth grain should be done in a room with a dry atmosphere. Stirring for 15 minutes will have made all the honey cloudy and a thickening up in body will be noticed. Frequent stirring can be given over the next 2 days until the honey has firmed up to such an extent that it requires immediate removal to whatever containers it is to be packed into.

## Correct Temperatures

The temperature that appears to be most conducive to rapid granulation is approximately 57 degrees F. If the stirred honey is left above 60 degrees F. granulation will be slow and it will



The honey on the left has had starter added and that on the right has been left to granulate without any starter.

118—TEXTURE OF HONEY . . .

be found that the honey remains soft and in a few weeks coarse grains become noticeable. To be successful in producing smooth grain beekeepers will have to secure the desired temperature. In winter cool evenings will generally give the approximate temperature. During summer, however, artificial methods have to be employed. For small quantities the household refrigerator may be used. For beekeepers handling larger quantities, specially prepared cool rooms are necessary. It is usually a waste of time and good starter if the proper temperature is not attained.

Honey treated in the manner described will usually granulate firm and be of smooth texture in less than a week. Honey varies in the time it takes to granulate, but an unduly prolonged setting will seldom give smooth grain.

Points arising out of this discussion on the smooth granulation of honey are:—

Consumers appreciate a smooth-grained honey.

Beekeepers should endeavour to see that all honey sold is in its most attractive form.

Processing for smooth grain is simple, provided instructions are followed.

Dry conditions should be assured when honey is being processed or packed.

The time taken for honey to granulate has a very definite bearing on the smoothness of the grain.

Smooth, grainless honey is a pure product and the beekeeper never requires to add other substances to attain this condition.

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## Submission of Claims for Death Duty Relief

Where it is claimed that payment of full death duty on farmers' estates would require the sale of the whole or part of the land and stock, administrators are urged to submit claims for relief as soon as possible to the secretary, Farmers' Death Duty Investigation Commission, P.O. Box 2198, Wellington.

Information as to the form and substance of claims may be obtained from any District Office of the Duties Division, Inland Revenue Department.

Applications will be received up to 30 April 1953 and in special circumstances after that date.

Under Section 4 of the Finance Act (No. 2) 1952 the Commission may recommend the Government to waive penalties, part or whole of the interest, and 20 per cent. of the death duty on estates of farmers who died between 1 September 1950 and 7 August 1952.

Relief may be recommended where the sole or main asset is farm land and stock, and where the beneficiaries are wife, husband, children, or grandchildren of the deceased farmer. The Commission must be satisfied that payment of full duty would require the sale of the whole or part of the land and stock, and that such a sale would be against general economic interests in that production would be reduced.

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# Damage to Potatoes by Mechanical Diggers

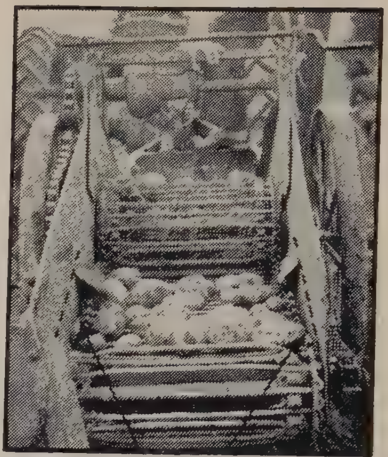
DRY rot infection caused by fusarium soil fungi gaining entry through the broken skin of damaged tubers very frequently results in severe loss of stored potatoes. The main source of damage resulting in this infection is mechanical injury sustained during digging, but precautionary measures will reduce digger damage and minimise subsequent losses. The crop should be fully mature when dug; immature, tender-skinned tubers are readily injured. Depth of digging should be regulated to avoid tuber damage by the digger shoe.

EXCESSIVE digging speed is responsible for much damage by mechanical diggers. The forward speed of the implement may contribute to the extent of the injury inflicted, but apron speed is the more important factor.

Tubers come off the digger shoe with some force, especially if the forward speed is excessive, and when apron speeds are high tubers tend to strike the apron bars rather than flow over them. In dry soil the limited amount of earth accompanying tubers over the aprons fails to cushion the effects of the agitating bars.

Under these conditions risk of damage increases, and apron speed should be reduced accordingly. Similarly, with sticky soils or prevalent weed growth the natural tendency to increase apron speed should be avoided. Tests have shown that, despite the cushioning effect of extra soil and top growth carried over the aprons under such circumstances, high speeds will result in increased tuber damage.

The separate motor and gearing of engine-functioned diggers—with independently governed ranges for travelling and apron speeds—afford greater flexibility than ordinary trailer models or those driven by power take-off. Under clean digging conditions damage resulting when tubers drop from the elevating apron on to the rear apron can be overcome by dispensing with the latter or by draping rubber side flaps over it. Rubber-covered apron bars also help to minimise tuber injury.



Strips of rubber fitted along each side of the frame of the potato digger as indicated by the dotted lines and arrows will lie over the ends of the bars of the second apron, thus breaking the fall and throwing the potatoes more into the centre of the apron. This minimises damage to tubers.

—*F. G. FERGUSON,*
*Fields Instructor,*
*Department of Agriculture,*
*Christchurch*

## Meteorological Records for December

| Station | Height of station above M.S.L. (ft.) | Air temperatures in degrees (Fahrenheit) | | | | Rainfall in inches | | | | | Bright sunshine hours |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Approx. mean | Difference from normal | Absolute maximum and minimum | | Total fall | No. of days of rain | Difference from normal | Maximum fall | | |
| | | | | Maximum | Minimum | | | | Amount | Date | |
| Kerikeri | 201 | 62.7 | + 0.0 | 77.0 | 44.9 | 6.07 | 13 | + 2.19 | 2.27 | 4 | 172.7 |
| Auckland | 160 | 64.0 | + 0.3 | 74.9 | 52.0 | 3.66 | 14 | + 0.73 | 1.42 | 20 | 169.8 |
| Tauranga | 10 | 62.4 | + 0.3 | 78.7 | 47.4 | 6.33 | 12 | + 2.80 | 2.33 | 1 | 219.0 |
| Ruakura | 131 | 60.8 | + 0.1 | 77.8 | 42.2 | 3.22 | 13 | + 0.14 | 1.22 | 9 | 195.7 |
| Rotorua | 969 | 60.7 | + 0.7 | 81.2 | 44.2 | 7.19 | 13 | + 3.21 | 2.18 | 1 | 184.3 |
| Gisborne | 12 | 62.4 | — 0.8 | 80.4 | 43.0 | 3.65 | 21 | + 1.74 | 0.79 | 5 | 168.4 |
| New Plymouth | 160 | 61.4 | + 1.4 | 78.0 | 47.7 | 4.98 | 15 | + 0.39 | 1.09 | 9 | 209.6 |
| Napier | 5 | 63.2 | + 0.0 | 80.3 | 49.5 | 1.93 | 14 | — 0.05 | 0.48 | 1 | 196.2 |
| Karioi | 2125 | 56.8 | + 1.6 | 79.0 | 41.0 | 4.85 | 15 | + 0.94 | 0.67 | 3 | |
| Wanganui | 72 | 62.9 | + 1.5 | 76.9 | 49.1 | 2.67 | 11 | — 0.19 | 0.47 | 9 | 207.3 |
| Palmerston North | 110 | 61.7 | + 1.3 | 76.0 | 47.0 | 4.83 | 17 | + 1.55 | 0.97 | 22 | 159.5 |
| Waingawa | 350 | 60.2 | + 0.0 | 80.5 | 43.5 | 4.98 | 18 | + 2.47 | 1.07 | 9 | 187.7 |
| Wellington | 415 | 60.3 | + 1.2 | 74.4 | 47.2 | 3.59 | 13 | + 0.13 | 1.17 | 9 | 180.9 |
| Nelson | 5 | 60.4 | + 1.0 | 73.3 | 38.0 | 3.89 | 14 | + 1.05 | 0.89 | 6 | 203.1 |
| Blenheim | 12 | 61.4 | + 0.1 | 81.0 | 38.4 | 3.97 | 16 | + 1.97 | 1.47 | 9 | 202.1 |
| Hokitika | 12 | 58.1 | + 2.0 | 74.0 | 39.4 | 3.49 | 14 | — 6.47 | 0.91 | 14 | 235.0 |
| Hanmer | 1225 | 57.2 | — 0.6 | 83.5 | 39.0 | 5.03 | 17 | + 1.32 | 1.56 | 4 | 152.9 |
| Christchurch | 22 | 60.8 | + 1.0 | 78.7 | 44.3 | 2.26 | 12 | — 0.28 | 0.82 | 15 | 171.4 |
| Ashburton | 323 | 61.0 | + 1.9 | 82.0 | 40.6 | 3.42 | 13 | + 0.41 | 0.84 | 1 | 177.3 |
| Timaru | 56 | 61.1 | + 2.4 | 83.0 | 41.5 | 2.99 | 8 | + 0.33 | 0.90 | 1 | 195.9 |
| Alexandra | 520 | 63.5 | + 3.2 | 90.9 | 40.5 | 0.97 | 9 | — 0.33 | 0.40 | 3 | 207.9 |
| Taieri | 80 | 58.6 | + 2.6 | 79.3 | 41.6 | 1.45 | 11 | — 1.11 | 0.58 | 6 | 174.6 |
| Invercargill | 0 | 57.0 | + 2.0 | 75.7 | 38.6 | 2.57 | 10 | — 1.03 | 1.06 | 7 | 197.2 |

# Disease in the Household Poultry Flock

LOSS of or illness in laying birds in a small flock is very often caused by one of the miscellaneous troubles other than the well-known specific diseases such as coccidiosis or tuberculosis. A short description of a number of these common ailments is given in this article contributed by the Animal Industry Division.

THE frequency with which some of the upsets in the oviduct or egg tract occur in the laying bird has led to the apt description of these conditions as occupational hazards. The heavy strain imposed on birds which are laying heavily exposes them to breakdowns of individual organs or parts of the system.

## Prolapse of the Oviduct

The protrusion of a small or large portion of the oviduct through the vent is called a prolapse or a "blow-out". The condition may arise from the presence of a particularly large or a broken egg in the oviduct, the strain of heavy laying, highly stimulating food such as poultry spices, or severe fright. The prolapse is usually evident as a red mass at the vent.

**Treatment:** If the bird is observed soon after the prolapse has taken place, prompt treatment may be successful. The prolapsed portion of the oviduct should be washed with normal saline solution (boiled water to which has been added one teaspoonful of common salt to each pint), and carefully replaced with the fingers. Some of the cold normal saline solution should then be injected into the vent to reduce the swelling of the tissues, and a few silk or cotton stitches inserted across the vent to ensure that there is no recurrence of the prolapse.

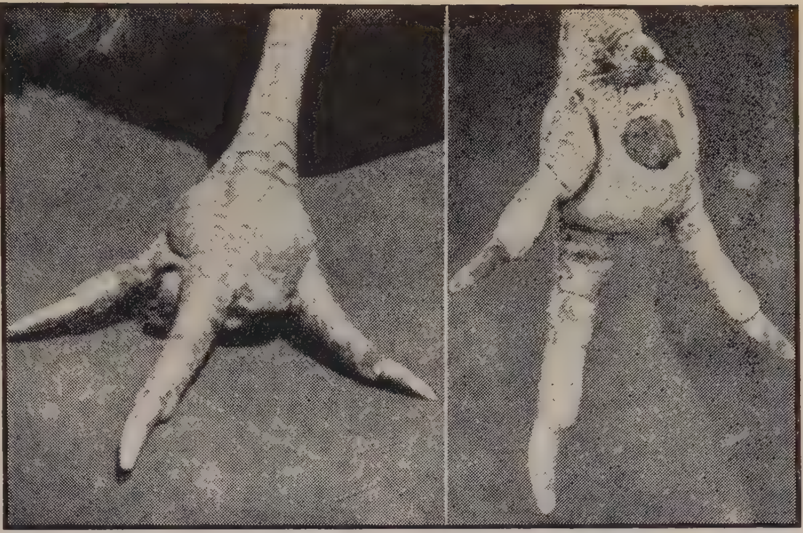
The stitches can be removed in a few hours; as an alternative to stitches a pad of cottonwool soaked in cold water may be tied over the vent. The bird will usually go off the lay for some time, but generally recovers.

## Egg Bound

Although the condition of egg bound may be caused by a number of factors, such as the presence of too large an egg in the oviduct, obstructions due to tumours, or even a form of fowl paralysis, its occurrence is not as frequent as may appear. The affected bird, usually a young pullet, is restless and by its frequent visits to the nest shows a desire but an inability to lay. Straining may eventually lead to prolapse of the oviduct.

**Treatment:** The application of a little olive oil or liquid paraffin on the end of a feather to the inside of the vent is sometimes of value. Holding the bird over a vessel containing hot water for a few minutes may be successful, as the warm steam helps to relax the lower end of the egg tract.

If the egg is visible or can be felt with the finger, an attempt should be made to remove it. It is usually necessary to break the egg to do so, and great care must be taken so that the bird will not be injured. All the pieces of shell must be removed, and the passage douched with normal saline solution.


[*Fraser Niederer photos.*

Front and back views of the foot of a fowl suffering from bumble foot.

## Egg Peritonitis

The sudden death of birds in good condition and laying well is frequently due to egg peritonitis. Death may be preceded by symptoms of dullness, darkening of the comb, and panting.

On post-mortem examination a hard, yellow-white mass in the abdomen or a shiny fluid covering the organs and the peritoneal lining of the cavity is found. The presence of this material in the abdomen indicates that an egg yolk has either failed to enter the oviduct or has been pushed up out of it by reverse movement of the walls of the oviduct. It may also arise from the rupture of the oviduct through blockage by retained eggs which fail to pass downward. The peritonitis probably arises from secondary bacterial infection. This condition quite often occurs in birds which are heavy layers.

No treatment can be given; preventive measures include avoiding a fattening diet, giving birds plenty of exercise, and only breeding from hens with good body size.

## "Waterbag" or "Penguin Disease"

A bird affected with "waterbag" or "penguin disease" (the names are merely used as convenient descriptions) assumes an upright position and walks or waddles like a penguin or duck. In many cases the abdomen is found to be enlarged and filled with dropsical fluid. This condition may arise from tuberculosis, tumours in the abdomen, ovarian cysts, egg peritonitis, or liver disease. There is no successful treatment.

## Bumble Foot

Bumble foot, a well-known condition, is commonly observed in household poultry flocks and also in some birds on commercial farms. The initial cause is usually a bruise or cut on the ball of the foot which allows entry of infective bacteria culminating in abscess formation. The bird goes lame and the swelling of the ball of the foot is obvious. The pain may cause the bird to cease laying.

**Treatment:** If a scab is present under the foot, it should be removed and the pus present in the swelling squeezed out. As the condition is really an abscess, it may be necessary to apply hot water or a poultice to soften it before the pus is removed. If lancing is required, a fairly deep cut with a sharp razor blade will release the contents of the swelling. Pressure should be applied to the swelling to squeeze out the yellow necrotic core; otherwise healing will not take place.

After the affected foot has been cleaned out it should be bathed with a warm antiseptic solution and bandaged. If the bandage is covered with Stockholm tar or shellac varnish, it will remain firmly in position for 2 or 3 days. The bird should be isolated for a few days to assist recovery.

The disease conditions described in this and the previous articles in this series represent only a proportion of the troubles experienced in poultry keeping. The aim has been to deal with those most likely to affect a small flock. Further information on these or other diseases is readily available from the nearest Poultry Instructor of the Department of Agriculture. Bulletins which give fuller details of individual diseases are obtainable from offices of the Department of Agriculture.

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# Care of Livestock during March

Contributed by the Animal Research Division

### PULPY KIDNEY VACCINATION OF EWES

If losses from pulpy kidney are usually experienced in lambs under 6 weeks of age, they can be prevented only by vaccinating the ewes. If ewes have not been vaccinated in previous years, the first dose should be injected when they are crutched before tupping and another dose should be injected just before lambing. Ewes which have been vaccinated in previous years require only the pre-lambing injection. Vaccination should be done in temporary yards. Syringes should be boiled before use and needles should be kept in methylated spirit and wiped and changed each time the syringe is filled. Vaccination of ewes will not be effective in preventing losses in lambs over 6 weeks of age. Where such losses occur it is necessary to vaccinate the lambs themselves.

### FEED HAY TO CALVES

Calves should have access to good hay at all times. It is particularly valuable after the first autumn rains, and will greatly assist in preventing the severe scouring which sometimes occurs after the grazing of lush, rapidly growing pasture. Make sure that the calves are rotated through the paddocks at intervals of a few days. Set stocking at this time of year is bound to result in scouring, unthriftiness, and some deaths.

### BLOWFLY STRIKE IN SHEEP

Blowfly strike is likely to occur in showery autumn weather when the humid conditions do not allow rapid drying of the fleece. Constant supervision is necessary to ensure that all cases are treated in the early stages. The wool should be sheared so as to leave a clean margin all round the strike, and a careful watch should be kept for narrow tracks leading to areas some distance from the original strike. The affected sheep should be treated with a good non-irritant dressing and the maggots should be collected and destroyed, as, if these are allowed to fall to the ground, they are capable of hatching into flies. Jetting with preparations containing D.D.T. or "Gammexane" will protect sheep against blowfly strike for several weeks.

### LENGTH OF LACTATION PERIOD

If dairy cows are well fed, they do not need more than 60 days' rest between lactations. New Zealand Dairy Board statistics show that the average length of lactation in New Zealand is only 248 days. Production should be materially increased by milking cows longer. A good rule is to continue milking a cow while she is giving more than 10lb. of fat per month, unless she is within 60 days of calving.

### CULLING OF EMPTY COWS

A cow should never be culled for sterility without being examined for pregnancy by a veterinary surgeon. Many cows thought to be empty have proved to be in calf when slaughtered at the works. Presence or absence of heat is not an infallible guide in diagnosing pregnancy. Good producers which are empty may be worth keeping, as about 80 per cent. of such cows hold when mated in the following season.

### SLEEPY SICKNESS IN EWES

Sleepy sickness, which in some seasons causes severe losses in pregnant ewes, is due to a sudden drop in the food supply just before lambing. On many farms the only feasible way of avoiding this is by shutting up pasture in autumn for grazing by the ewes for 3 weeks before lambing. Short-rotation ryegrass is particularly valuable for this purpose, as it continues to grow during the winter, even in Southland.

### LEAD POISONING IN CATTLE

Many cattle die from lead poisoning each year. Common sources of lead on the farm are old paint tins, discarded scraps of metallic lead, and old batteries. These should be buried or disposed of in such a way as to prevent cattle from having access to them. Calves frequently suffer from lead poisoning through licking painted surfaces, and care should be taken to prevent their doing this.

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## Dairy Produce Graded for Export

The following figures showing quantities of dairy produce graded for export during December and for the 5 months ended 31 December 1952, with comparative figures for the same month and 5-monthly period of 1951, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

### BUTTER

| Period | Tons<br>Creamery | Whey | Total | Percentage Inc. or dec. |
|---|---|---|---|---|
| December 1952 .. .. | 23,737 | 458 | 24,195 | — |
| December 1951 .. .. | 21,738 | 348 | 22,086 | — |
| Increase or decrease .. | +1,999 | +110 | +2,109 | +9.549 |
| 5 months ended 31/12/52 | 94,923 | 1,666 | 96,589 | — |
| 5 months ended 31/12/51 | 89,731 | 1,462 | 91,193 | — |
| Increase or decrease .. | +5,192 | +204 | +5,396 | +5.917 |

Butter in store at 31 December 1952 was 18,671 tons

### CHEESE

| Period | Tons<br>White | Coloured | Total | Percentage Inc. or dec. |
|---|---|---|---|---|
| December 1952 .. .. | 16,233 | 8 | 16,241 | — |
| December 1951 .. .. | 13,132 | 260 | 13,392 | — |
| Increase or decrease .. | +3,101 | —252 | +2,849 | +21.274 |
| 5 months ended 31/12/52 | 52,404 | 64 | 52,468 | — |
| 5 months ended 31/12/51 | 46,562 | 316 | 46,878 | — |
| Increase or decrease .. | +5,842 | —252 | +5,590 | +11.924 |

Cheese in store at 31 December 1952 was 13,102 tons

If these figures are converted into butterfat equivalent, there is an increase of 7.047 per cent. in butterfat graded for the 5 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

# Autumn-sown Pastures and Grass-grub Control

## Seasonal Notes by the Extension Division

ALTHOUGH pasture mixtures are fairly well standardised in most districts, variations should be made to cover particular soil fertility and stock feeding requirements, and advice on adaptations required may be obtained from Extension Division Instructors in Agriculture.

### SUBTERRANEAN CLOVER ON COASTAL SANDS

ON the extensive area of coastal sand country on the Wellington west coast there are fairly large areas of drier sandy flats, rolling sand country, and consolidated ridges. In the early stages of pasture establishment and improvement these areas dry out too severely in summer and early autumn for white clover to persist and thrive in the pastures. On these drier types of sand country subterranean clover can and should be used to improve deteriorated pastures or to establish new pastures. On the light sandy flats and ploughable rolling country subterranean clover is best introduced in complete pasture mixtures, preferably in autumn and after suitable seed-bed preparation. With regular phosphate topdressing, good establishment of the clover, and its maintenance and increase by spelling at the right time to encourage seed setting these areas show considerable improvement in pasture production, particularly in late autumn, winter, spring, and early summer. With better pastures and increased stock-carrying capacity the soil condition and fertility of the flats and low rolling country are gradually improved, giving the soils a greater moisture-holding capacity, which increases the grazing range into the drier periods. Where the sand ridges carrying deteriorated pastures are too steep for ploughing and cultivation subterranean clover can be introduced by broadcasting or surface sowing from 2 to 4lb. of seed per acre with phosphate topdressing in autumn. With swards containing subterranean clover spelling in late spring to encourage flowering and seed setting is important, particularly in the first spring after establishment. Once firmly established on the ridge country, subterranean clover is of extreme value in building up soil fertility, in improving the palatability of the existing grass sward, and in increasing the carrying capacity and fattening quality of the pasture.

—*J. M. HOPKINS*

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### *PHALARIS TUBEROSA*

*PHALARIS TUBEROSA* has been grown experimentally in Hawkes Bay over the past 10 years, and trials have shown that once it is established it is more persistent and provides a longer growing period than perennial ryegrass and is better than cocksfoot on the lighter, drier soils. It also resists attack by grass-grub. These trials, which have been laid down on both flat and rolling country and have been subjected to various systems of management, have all proved that this grass will persist where others will not survive. It makes strong growth in spring, grows well into summer, is dormant during late summer, but comes away quickly immediately autumn rains fall. During winter it makes slow growth, particularly if long periods of frosts occur. Those local farmers who have been growing this grass have been doing so only for a relatively short time, and no reliable data are yet available on its carrying capacity. There is ample proof, however, that on lighter soils with low rainfall phalaris has produced feed when other grasses have failed; it has maintained a good ground cover, conserved what moisture remained in the soil, and consequently made it possible for clovers to persist. Under a really dry summer in the low-rainfall areas in Hawkes Bay grasses and clovers are literally burnt out by the heat of the sun. Phalaris will withstand this heat and make strong growth immediately rain falls.

### ESTABLISHMENT

Phalaris may be established with a seeding of from 3 to 5lb. per acre, with or without subterranean and/or white clover. A good, clean seed-bed is essential. The seed may be either drilled or broadcast in early autumn. If the seed is broadcast, it should be well covered. Phalaris should not be sown with perennial ryegrass, because the early growth of young ryegrass smothers the slower-establishing phalaris and a very poor stand results. It may, however, be sown with cocksfoot, and a sowing of 5lb. of phalaris, 5lb. of cocksfoot, and 3lb. of subterranean clover per acre has proved successful. Another satisfactory method of establishment is to drill 5lb. of seed in with a rape crop in October. By the time the rape is fed off the plants are well established, and with light cultivation other pasture species such as cocksfoot and clovers may be added. Surface sowing on old pasture is not recommended. On the lighter and drier soils establishment from autumn sowing is slow, and lenient grazing should be practised during the first year. The clovers should provide the bulk of the first year's grazing, and for this reason ample clover should be sown.

—*R. P. HILL*

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### RATES OF SEEDING

RATES of seeding vary in different districts, and high rates are usual in the high-rainfall districts. In the North and South Auckland Land Districts the normal seeding of perennial ryegrass in a mixture is about 25lb., but lower sowings are often advocated on the assumption that there may be a tendency for the higher rate to suppress white clover establishment. This difficulty does not occur if pastures are sown on a well-prepared seed-bed in early autumn and grazed before winter. Trials carried out throughout the North and South Auckland Land Districts show that sowings of 15lb. of perennial ryegrass are not satisfactory in the early stages of the life of a pasture, and increased grass production (in the first season) gained from sowing 25lb. will more than compensate for the 10s. paid for the additional seed. Auckland trials have proved that the rate of seeding prescribed in the past by Instructors in Agriculture for various land classes are correct for general purposes, and farmers requiring advice on seed mixtures should seek information from their local Instructor in Agriculture.

—*J. E. BELL*

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### GRASS-GRUB IN PASTURES

ALTHOUGH grass-grub is plentiful in many parts of the country, it causes severe damage, chiefly in districts subject to dry weather, in summer and autumn. Preventive measures, of which knowledge is now available, should be adopted in districts subject to damage. The application of D.D.T. or B.H.C. at the rate of 1lb. of active ingredient per acre will give satisfactory control for a year and is recommended for most pastures. Applications of 2lb. per acre are recommended for treating young pastures and those that are to be used for seed production. Such an application is usually effective for from 2 to 3 years. D.D.T. and B.H.C. are most readily used as a mixture with fertiliser and may be applied at the time topdressing is usually carried out. Because these chemicals are lethal to bees, they should not be applied when bees are pollinating clover. The effectiveness of the chemicals for grass-grub control depends on their reaching and being incorporated in the soil. For this reason it is necessary that pastures should be closely grazed at the time of application.

—*S. H. SAXBY*

## TABLE 1—ADVANTAGE IN RETURNS TO HILGENDORF GROWERS IN MAIN WHEAT-GROWING COUNTIES

| County | Number of crops | | | | | | Average yields in bushels per acre | | | | | | Advantage to Hilgendorf grower calculated on 11s. a bushel for Cross 7 and 12s. for Hilgendorf | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hilgendorf | | | Cross 7 | | | Hilgendorf | | | Cross 7 | | | | | |
| | 1952 | 1951 | 1950 | 1952 | 1951 | 1950 | 1952 | 1951 | 1950 | 1952 | 1951 | 1950 | 1952 | 1951 | 1950 |
| | | | | | | | | | | | | | £ s. d. | £ s. d. | £ s. d. |
| Masterton | 5 | 7 | 1 | 9 | 31 | 49 | 35.9 | 41.6 | — | 43.0 | 29.3 | — | −2 2 2 | +8 16 11 | — |
| Waimea | 5 | 2 | 1 | 20 | 17 | 15 | 49.5 | — | — | 34.6 | - - | — | +10 13 5 | — | — |
| Marlborough | 17 | 47 | 10 | 113 | 130 | 96 | 47.6 | 35.1 | 49.3 | 39.3 | 36.4 | 38.6 | +6 18 11 | +1 0 10 | +8 7 0 |
| Awatere | 2 | 8 | 3 | 11 | 26 | 26 | — | 45.3 | 40.7 | — | 32.0 | 26.2 | — | +9 11 7 | +10 0 2 |
| Amuri | 2 | 7 | 6 | 57 | 81 | 60 | — | 38.5 | 25.2 | — | 36.7 | 22.8 | — | +2 18 4 | +2 11 7 |
| Cheviot | 3 | 5 | 3 | 25 | 34 | 42 | 45.1 | 35.0 | 30.1 | 41.2 | 40.8 | 32.5 | +4 8 0 | −1 8 10 | +0 3 8 |
| Waipara | 2 | 6 | 17 | 82 | 152 | 107 | — | 41.8 | 25.5 | — | 38.4 | 31.1 | — | +3 19 2 | −3 7 2 |
| Kowai | 1 | 2 | 17 | 39 | 84 | 68 | — | — | 31.5 | — | — | 33.7 | — | — | +0 7 4 |
| Eyre (west) | 3 | 7 | 2 | 39 | 60 | 55 | — | 35.3 | — | — | 42.6 | — | — | −2 5 0 | — |
| Eyre (east) | 4 | 4 | 2 | 15 | 36 | 34 | 25.3 | 37.5 | — | 32.5 | 38.9 | — | −2 13 11 | +1 2 1 | — |
| Oxford | 4 | 1 | 1 | 21 | 27 | 34 | 25.5 | — | — | 28.3 | — | — | −2 13 0 | — | — |
| Malvern | 6 | 25 | 14 | 112 | 150 | 100 | 39.5 | 41.4 | 38.7 | 36.9 | 40.4 | 41.0 | +3 8 1 | +2 12 5 | +0 13 5 |
| Paparua (west) | 3 | 6 | 3 | 44 | 68 | 43 | — | 41.9 | 22.2 | — | 47.9 | 30.5 | — | −1 4 1 | −3 9 1 |
| Springs | — | 3 | 7 | 26 | 58 | 30 | — | 38.5 | 34.5 | — | 48.7 | 37.6 | — | −3 13 8 | +0 0 5 |
| Ellesmere | 2 | 16 | 16 | 99 | 215 | 116 | — | 49.2 | 44.2 | — | 54.7 | 43.2 | — | −0 11 4 | +2 15 2 |
| Selwyn | 3 | 7 | 6 | 38 | 71 | 55 | — | 35.1 | 36.7 | — | 41.9 | 32.0 | — | −1 19 8 | +4 8 5 |
| Ashburton (west) | 3 | 6 | 2 | 20 | 76 | 45 | — | 46.3 | — | — | 39.4 | — | — | +6 2 2 | — |
| Ashburton (main) | 14 | 63 | 36 | 221 | 315 | 266 | 42.9 | 40.2 | 38.9 | 41.2 | 40.6 | 38.3 | +3 1 7 | +1 15 10 | +2 5 6 |
| Ashburton (east) | 20 | 15 | 21 | 302 | 321 | 293 | 40.2 | 44.0 | 43.8 | 42.1 | 42.8 | 42.5 | +0 19 4 | +2 17 2 | +2 18 1 |
| Geraldine (west) | 1 | 1 | 6 | 52 | 84 | 91 | — | — | 47.8 | — | — | 41.4 | — | — | +5 18 2 |
| Levels (north) | 2 | 1 | 4 | 105 | 101 | 98 | — | — | 17.5 | — | — | 34.4 | — | — | +8 8 5 |
| Waimate (north) | — | 3 | 4 | 98 | 154 | 134 | — | 43.9 | 26.8 | — | 42.9 | 37.0 | — | +2 14 11 | −4 5 5 |
| Southland | 5 | 4 | — | 304 | 412 | 332 | 60.9 | 54.9 | — | 58.8 | 50.5 | — | +4 4 0 | +5 3 4 | — |
| Wallace | 5 | 1 | — | 86 | 126 | 139 | 64.7 | — | — | 62.8 | — | — | +4 5 7 | — | — |
| **New Zealand totals for all Hilgendorf and Cross 7 crops (figures are of all crops known to statistician, and not totals of columns above)** | | | | | | | | | | | | | | | |
| | 131 | 291 | 206 | 2,758 | 4,101 | 3,467 | 40.8 | 40.9 | 37.6 | 42.5 | 42.8 | 39.1 | +1 2 1 | +1 0 0 | +1 1 1 |
| Areas in acres | 2,088 | 5,461 | 2,922 | 52,146 | 86,656 | 71,991 | | | | | | | | | |

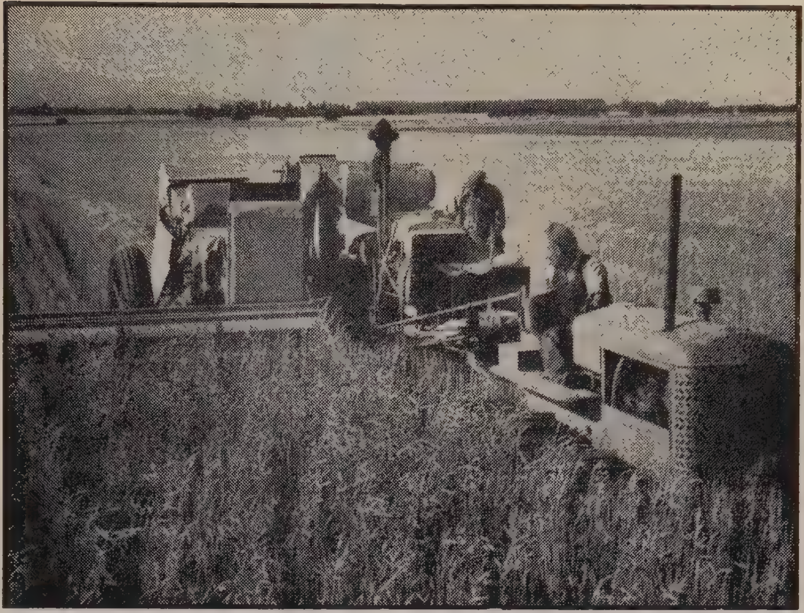
## TABLE 2—COMPARISON OF YIELDS AND RETURNS OF HILGENDORF AND CROSS 7 WHEAT IN THE FIVE MAIN HILGENDORF-GROWING COUNTIES

| County | Year | Hilgendorf | | | | Cross 7 | | | | Return per acre | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of crops | Area in acres | Yield | Average yield per acre | No. of crops | Area in acres | Yield | Average yield per acre | Standard prices per bushel f.o.r. | Hilgendorf with 1s. premium | Cross 7 | Difference in favour of Hilgendorf |
| | | | | | | | | | | s. d. | s. | s. | £ s. d. |
| Marlborough | 1951-52 | 17 | 192 | 9,132 | 47.56 | 113 | 1,547 | 60,823 | 39.32 | 10 0 | 523.16 | 393.20 | +6 9 11 |
| | 1950-51 | 47 | 673 | 23,625 | 35.10 | 130 | 2,259 | 82,245 | 36.41 | 9 9 | 377.32 | 355.0 | +1 2 4 |
| | 1949-50 | 10 | 99 | 4,876 | 49.25 | 96 | 1,478 | 57,088 | 38.63 | 8 4 | 459.66 | 321.92 | +6 17 9 |
| Malvern | 1951-52 | 6 | 100 | 3,951 | 39.51 | 112 | 3,056 | 112,719 | 36.88 | 10 0 | 434.61 | 368.80 | +3 5 10 |
| | 1950-51 | 25 | 403 | 16,663 | 41.35 | 150 | 4,274 | 172,773 | 40.42 | 9 9 | 444.51 | 394.09 | +2 10 5 |
| | 1949-50 | 14 | 214 | 8,273 | 38.66 | 100 | 2,901 | 118,852 | 40.97 | 8 4 | 360.83 | 341.42 | +0 19 5 |
| Ellesmere | 1951-52 | 2 | — | — | — | 99 | — | — | — | 10 0 | — | — | — |
| | 1950-51 | 16 | 292 | 14,379 | 49.24 | 215 | 4,600 | 251,462 | 54.67 | 9 9 | 529.33 | 533.03 | −0 3 8 |
| | 1949-50 | 16 | 289 | 12,779 | 44.22 | 116 | 2,669 | 115,402 | 43.24 | 8 4 | 412.72 | 360.33 | +2 12 5 |
| Ashburton (main) | 1951-52 | 14 | 277 | 11,876 | 42.87 | 221 | 7,525 | 309,624 | 41.15 | 10 0 | 471.57 | 411.50 | +3 0 1 |
| | 1950-51 | 63 | 1,638 | 65,841 | 40.20 | 315 | 10,514 | 426,965 | 40.61 | 9 9 | 432.15 | 395.95 | +1 16 2 |
| | 1949-50 | 36 | 693 | 26,953 | 38.89 | 266 | 8,836 | 338,237 | 38.28 | 8 4 | 362.97 | 319.00 | +2 4 0 |
| Ashburton (east) | 1951-52 | 20 | 384 | 15,429 | 40.18 | 302 | 7,710 | 324,638 | 42.11 | 10 0 | 441.98 | 421.10 | +1 0 10 |
| | 1950-51 | 15 | 285 | 12,531 | 43.97 | 321 | 9,714 | 416,183 | 42.84 | 9 9 | 472.68 | 417.69 | +2 15 0 |
| | 1949-50 | 21 | 336 | 14,718 | 43.80 | 293 | 8,742 | 371,573 | 42.50 | 8 4 | 408.80 | 354.16 | +2 14 8 |
| All 5 counties | 1951-52 | 59 | 953 | 40,388 | 40.72 | 847 | 21,641 | 807,804 | 40.72 | 10 0 | 447.92 | 407.20 | +2 0 8 |
| | 1950-51 | 166 | 3,291 | 133,039 | 43.03 | 1,131 | 31,361 | 1,349,628 | 43.35 | 9 9 | 462.57 | 422.66 | +1 19 11 |
| | 1949-50 | 97 | 1,631 | 67,599 | 41.44 | 871 | 24,626 | 1,001,152 | 40.65 | 8 4 | 386.77 | 338.67 | +2 8 1 |

# Results from Growing of Hilgendorf Wheat

THE outstanding baking quality of Hilgendorf wheat has been confirmed by commercial crops during the past 3 years. These crops showed also that with the premium of 1s. per bushel Hilgendorf was, on the average, more profitable to growers than Cross 7. Bakers are anxious to obtain more Hilgendorf flour, but millers cannot provide it until growers produce sufficient Hilgendorf wheat. This article by L. G. L. Copp, Crop Research Division of the Department of Scientific and Industrial Research, and E. W. Hullett, Wheat Research Institute, gives details of yields under commercial conditions and a summary of growers' replies to questionnaires circulated in 1950 and 1951.

THE origin and description of Hilgendorf wheat were given by O. H. Frankel, formerly of the Wheat Research Institute, and E. W. Hullett in the February 1948 issue of this "Journal".



[*National Publicity Studios photo.*

## Yields of Hilgendorf

As farmers cannot be expected to grow crops which do not promise an adequate return, it is important to discover whether the yields of Hilgendorf make it a profitable crop to grow. The Government Statistician has made available the analysis of the returns received from owners of threshing mills and header harvesters. The returns cover about four-fifths of the area harvested. It should, therefore, be borne in mind that this survey covers a substantial proportion of the whole area harvested, so that average yields per acre can be accepted as reasonably correct. In data supplied by the Government Statistician the returns contain no details of area and total yields where the number of crops in a county is fewer than four. Over the 3 years 32 crops were grown in five counties in the North Island, where Tainui is the standard variety. Therefore it is not possible to make a direct comparison between the total yields of Hilgendorf and Cross 7 for all the counties in which Hilgendorf was grown.

Hilgendorf was grown in 37 counties in 1951-52, 47 in 1950-51, and 37 in 1949-50. Table 1 on the opposite page shows those counties in which four or more crops were grown in any 1 year. The first crop of a new variety would probably be grown on the best parts of a farmer's wheat area, so that the average yields were possibly higher than those to be expected when Hilgendorf was more widely grown. The figures in bold type in Table 1 indicate those districts where Hilgendorf has been grown extensively.

## Effect of Premium

The profitability of Hilgendorf compared with Cross 7 cannot be gauged from the wheat yields alone. Allowance must be made for the premium paid for Hilgendorf. Farmers might use the table to help them to decide which wheat they will grow in the coming season; therefore the figures given in the last three columns are based on an assumed price of 11s. per bushel for Cross 7 and 12s. for Hilgendorf. The figures were obtained by multiplying 12s. by the average number of bushels per acre of Hilgendorf and subtracting from the result the figure obtained by multiplying 11s. by the number of bushels per acre of Cross 7. The New Zealand average yields for the two varieties and the extra profit from Hilgendorf calculated in the same way are given at the foot of the table. The figures show that at the assumed prices the Hilgendorf growers would have received approximately £1 per acre more than the Cross 7 growers.

Only in five counties has there been grown a sufficient quantity of Hilgendorf to make real comparisons with Cross 7. For example, in Ashburton (main), in 1950-51, 63 Hilgendorf crops totalling 1638 acres were grown, with an average yield per acre of 40.2 bushels in comparison with a Cross 7 average of 40.6 bushels. With the premium of 1s. per bushel Hilgendorf was more profitable than Cross 7. The areas and total yields for the five counties in the 3 years are shown in Table 2 on the opposite page. The last three columns show the effect of the premium on the final return from the growing of Hilgendorf.

The results in these 3 years for these five counties show that those who grew Hilgendorf received on the average £2 an acre more than those who grew Cross 7. In only one instance was there a lower average cash return from Hilgendorf, and in that case the difference was only 3s. 8d. per acre.

## Growers' Opinions

To pool the experience of the first 2 years of large-scale cultivation the Wheat Research Institute asked grain merchants to distribute a questionnaire to their clients who had been growers of Hilgendorf in 1949-50 and 1950-51. This contained questions designed to provide a picture of how, in the grower's opinion, the new wheat compared with Cross 7 grown on similar land. There were also questions regarding damage by frost, birds, or disease, and a request for general comments.

In 1949-50, 41 per cent. of the growers were satisfied with their crops of Hilgendorf, although 11 per cent. lost their crops through widespread frost damage in North Canterbury. In the following year 54 per cent. of the farmers were satisfied, 9 per cent. were doubtful, and the rest would not grow it again.

The second season with adequate rainfall in contrast to the drought conditions in the first season should have given an indication of the capabilities of Hilgendorf wheat in a favourable year. Unfortunately the wet weather during January and February prolonged the harvest and many crops were left standing long after they were ripe. It became apparent that Hilgendorf is more damaged than Cross 7 when the harvest is unduly delayed by wet weather.

Most growers reported that Hilgendorf did not lodge or shed its grain in the field; it threshed as easily as Cross 7. Only one farmer reported that bird damage was extensive, most growers finding that such damage was confined to headlands or near trees. It was found that Hilgendorf is less subject to sprout damage than Cross 7. Hilgendorf is less resistant than Cross 7 to mildew when conditions are favourable to that disease. Its earliness aids the spreading of harvest operations, though it is considered by some to be too early to be sown in areas where frost damage is likely. Farmers have grown Hilgendorf successfully as a second crop on good land. In Marlborough two growers are of the opinion that Hilgendorf is

124—HILGENDORF WHEAT

more suitable than Cross 7 for feeding off. Yields of over 80 bushels per acre have been obtained.

## Baking Quality

Baking tests of Hilgendorf wheat received at the mills have confirmed the earlier trials. There is now no doubt that this variety when grown under commercial conditions has fulfilled its promise as a high-quality wheat. Bakers agree that bread made from Hilgendorf flour is comparable with bread made from Canadian flour. This is shown best of all by the exceptional keeping quality of the bread, which after a week is better than ordinary bread only 2 or 3 days old. This good keeping quality is to be expected from the very soft and finely textured crumb of Hilgendorf loaves.

Good keeping quality has become of the greatest importance in New Zealand, because the effect of the 5-day week in bakeries is that much of the bread used on Monday has to be made on the previous Friday or even Thursday. In spite of intensive world-wide research, no ingredient has been discovered, except first-class flour, which improves the keeping quality of bread in the measure required under these circumstances. It is believed, therefore, that the introduction of Hilgendorf into commercial use will prove to be the most important advance ever made in the bread industry of this country.

## Millers' Attitude

A special Hilgendorf flour would be eagerly sought by bakers. Millers, however, cannot be expected to mill such a flour unless they are assured of sufficient quantities of grain to warrant the change in their milling operations.

In the meantime until larger quantities of Hilgendorf are grown millers will continue to use in their ordinary grists any Hilgendorf grown, even though they cannot then recover the extra cost of the wheat. City millers are particularly keen to get Hilgendorf because there is greater need for improvement in the Australian wheat they mainly use than in the New Zealand wheat available to country millers.

## Advantages of Hilgendorf

Hilgendorf does well where soil and weather conditions are suitable, but it is less tolerant than Cross 7 to variation in soil fertility. Under unsuitable conditions it does not yield as well as Cross 7, but the premium of 1s. per bushel is designed to compensate the farmer for this. In assessing his returns per acre, the Hilgendorf grower should consider the value of sacks saved as well as the premium, and of course the extra price of seed must be deducted.

The New Zealand yield averages for Hilgendorf and Cross 7 in each of the past 3 years show that, on the average, growers of Hilgendorf received more per acre than those who grew Cross 7. In the five counties where Hilgendorf was grown the most extensively, the average return per acre was £2 more for Hilgendorf than for Cross 7. These results give ground for hope that in the coming years bakers will have the flour they need to give the people better bread.

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# Secondary Sowings on Hill Country

By E. A. MADDEN, Agrostologist, Department of Agriculture, Palmerston North

**MANY hill-country farmers have to wage war continually on second growth. Manuka is probably the most troublesome, but gorse, hard fern, bracken, and to a less extent tutsan, broom, and blackberry occupy land that should be growing pastures. In coastal districts tauhinu is a problem, and heath invades some higher hill country. A blight is killing manuka on extensive areas; gorse and blackberry are being tackled with toxic sprays; the slasher is being used on a variety of scrub plants, and judicious grazing with cattle and sheep is subduing bracken; but whether second growth control is carried out biologically, chemically, mechanically, or manually, fire is the main weapon for finally clearing the land. The sowing of inferior grasses and overgrazing have contributed to pasture deterioration and under these conditions weeds and scrub plants establish and spread readily, so that in conjunction with scrub control must go the best practical methods of pasture improvement.**

**In conjunction with scrub control on hill country must go the best practical methods of pasture improvement.**

REGARDLESS of climate, stock management, and topdressing, the basic factor governing pasture improvement is the composition of the pastures themselves. Those dominated by weeds and inferior grasses cannot respond to good treatment as quickly and efficiently as pastures containing a fair proportion of the higher-producing grasses and clovers. To some extent clovers can be established by oversowing, but it is not easy to get a "strike" from grass seeds, and whereas clover establishment is often barely satisfactory and even a failure, under similar conditions oversown grass seeds would be wasted. Apart from providing ash as a cover for pasture seeds, fire removes the top layer of vegetation, which tends to inhibit germination and establishment of sown species. But burning off is roundly condemned unless it is done to provide a clean seed-bed for the appropriate grasses and clovers.

## Suggested Seeds Mixtures

The selection of species for seeds mixtures for secondary sowings depends on natural soil fertility conditions (particularly soil moisture), and on whether the area is likely to be periodically topdressed. Most hill-country soils are of low natural fertility and browntop and danthonia are usually relied on to provide permanent cover; clovers are likely to be permanent only when the area is periodically topdressed. The following seeds mixtures are suggested as a basis for secondary sowings on areas that are respectively predominantly moist or dry:—

| | Moist lb. per acre | Dry lb. per acre |
|---|---|---|
| Certified perennial ryegrass .. .. .. | 8 to 10 | 6 to 8 |
| Crested dogstail .. | 3 to 4 | 2 to 3 |
| Certified browntop .. | 2 to 3 | ½ to 1 |
| Danthonia .. .. | 1 to 2 | 4 to 5 |
| Certified white clover .. | 1 to 2 | 1 to 2 |
| Certified subterranean clover .. .. .. | 1 | 2 to 4 |
| *Lotus major* .. .. | ½ to 1 | ½ |
| Yarrow .. .. .. | ¼ | ¼ |
| | 15½ to 23¼ | 15½ to 23¾ |

Where the cattle to sheep ratio is high 3 to 5lb. of cocksfoot should be added to the mixture. In warm districts 2 to 4lb. of paspalum should be included. One to two pounds of annual clovers could be profitably included, suckling clover in moist regions and clustered and striated clover in dry ones. Topdressing of secondary sowings is recommended.

Heading photograph by Department of Internal Affairs.

# 20 COMMANDMENTS for Good Pig Management

TWENTY points forming a sound basis for advice on pig husbandry were put forward by D. M. Smith, Research Officer, Department of Agriculture Animal Research Station, Ruakura, at a recent conference of District Pig Council supervisors at Ruakura. The points, which have been substantiated by research carried out at the station, form a good basis for management on the skimmed-milk farm and are presented in this article by E. D. Edwards, Technical Officer, Department of Agriculture, Wellington.

IN the absence of similar experimental work on whey-feeding farms the whey feeder can use the recommendations, provided he makes allowance for the lower solids status of whey, which has only two-thirds of the dry matter of skimmed milk and, unlike skimmed milk, is deficient in protein. The first ½lb. per pig per day of any meals fed on a whey farm should be meat meal. Sows should be farrowed a month earlier than is recommended for skimmed-milk farms.

The 20 points made by the Research Officer at Ruakura are:—

### 1. Select a prolific strain of breeding stock.

Though a particular breed may be fancied, there is often great variation in productivity within each breed and it is essential that the chosen strain of pigs should be capable of weaning at least 8 piglets per litter.

### 2. Mate sows on the second and third day of heat or run them with the boar where matings are spread.

Sows in good condition will come on heat about 3 or 4 days after weaning. To obtain the greatest number of fertilised ova and consequently large litters, mating should take place as late as possible in the heat period and for that reason controlled matings are recommended. Where matings are spread and also because the onset of heat in the sow can be missed the boar may be allowed to run with the sow after weaning.

### 3. For the first month after weaning feed sows 4 to 6 gallons of skimmed milk or its equivalent and grass.

A major cause of the difficulty in getting sows in pig is their poor condition at mating. The aim should be to feed the sow well before mating and so lessen the chance of her returning to the boar. Feeding for 1 month enables her to regain lost condition.

### 4. If after 1 month the sow has regained the condition lost while suckling, feed her only pasture until 7 days before farrowing.

A good-quality ryegrass and clover pasture is considered most suitable and economic in providing the sow with a maintenance ration over this part of the dry period.

### 5. Handle dry sows to get them quiet and used to attention.

Any profit the farmer sees in his sow at this stage may be lost entirely if the sow is neglected or maltreated over the next few days. It is advisable to get her accustomed to her farrowing quarters with quiet but firm handling.

### 6. Feed sows 4 to 6 gallons of skimmed milk or its equivalent from 7 days before farrowing.

The sow heavy in pig requires good feeding again to maintain the unborn litter and to enable her to reach her maximum milking capacity rapidly after farrowing. The build-up should be gradual and, rather than giving all as skimmed milk, use a pound or two of meat meal, as a protein-rich and not-too-bulky diet is essential.

### 7. Keep the sow's bowels open.

Pregnant sows may become constipated. There may be difficulty in farrowing at the expense of the piglets. Bran or molasses included in the ration should prevent this. If these are not available, medicinal paraffin as a lubricant is safe to use.

### 8. Reduce the ration 2 days before farrowing and for 2 days after farrowing.

It is better to under-feed rather than to over-feed around farrowing, but the sow must have access to plenty of clean drinking water.

HEADING PHOTOGRAPH: Prolific sows are essential for efficient pig production. Breeding stock should be selected from a prolific strain. The Large White is New Zealand's most prolific breed, but differences exist among strains in all breeds. B. S. Snowden photo.

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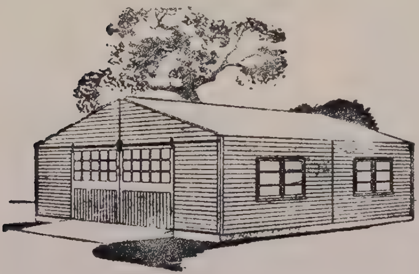

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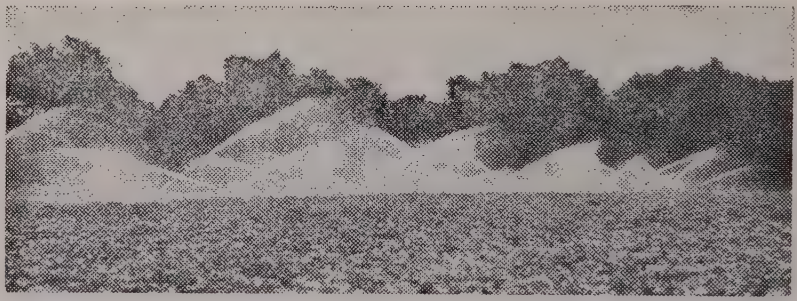

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### 9. Confine the sow at farrowing time.

If the sow is confined to clean, warm farrowing quarters, the farrowing may be observed and assistance given if necessary. As there is a considerable drop in body temperature of the piglets for a short time after their birth, warm quarters should be provided to ensure their survival. A suspended hurricane lamp is very useful to provide warmth in the farrowing house. Where the piggery is wired for electric power a brooder incorporating infra-red heat lamps may be used.

### 10. Feed the sow 4 feed units for herself and 2/3 unit for each piglet in the litter.

A ration of 4 feed units for the sow and 2/3 unit per piglet is only a guide to good feeding. The farmer should note by observation whether the ration is too large or too small. After farrowing the ration should be increased slowly until the sow is taking all she can readily consume. Over-feeding can cause scouring among the litter.

### 11. Graze the sow on good pasture daily and the litter once weekly. Provision of a sod of turf for the litter in the house is advisable.

If houses with control yards are used, a common run-out on a paddock, which may also be grazed by other stock, is recommended rather than small runs for each farrowing unit. Besides getting exercise, the sow can obtain her maintenance requirements from the pasture. Under these conditions sows can be run out daily between feeds while litters are kept in the houses, one litter at a time being allowed a run-out in rotation. The placing of meal and milk in the creep troughs while the litter is shut away from the sow will encourage piglets to start creep feeding early. Each litter must have a run-out in the first week of its life. If soil conditions are unsuitable because of wet weather, a sod should be cut and placed in the farrowing house so that the piglets can root in it and thus secure necessary minerals.

### 12. Creep feed the litter from 3 weeks old on milk and meal fed separately. The meal, fed dry, should always be available.

Though most sows reach a maximum milk production about the fourth or fifth week of lactation, the litter will take supplementary foods from the third week or earlier. This should be encouraged, as heavy weaners are most desirable. A portion of the house creep should be reserved for feeding meat meal or liver meal dry to the litter and a separate trough should be used for milk or whey. A self-feeding container for meal is well worth while.

### 13. Castrate at 3 weeks old.

Castration is easier to do and recovery is quicker if the operation is done when the pig is not more than 3 weeks old. Faulty castration is responsible for many carcasses being condemned and therefore cleanliness during the operation and until recovery is important. It is essential to allow thorough drainage of the wound by extending the cut sufficiently toward the belly. If the cut is made too high, a pouch will be formed which traps serous fluids and forms an ideal site for infection.

### 14. Wean pigs on to milk and meal. Feed meal for 3 weeks after weaning or until sufficient milk is available.

At 8 weeks of age the litter should be weaned by taking the mother away. The aim in feeding should be to keep the litter growing rapidly. For that reason meal must be included in their ration after weaning, as it is at this stage that meals can be used profitably, but there is less profit in feeding meal after the pigs have reached 100lb. liveweight. An advantage in feeding meal after weaning of winter litters is that the heavier pig produced can consume a greater quantity of the increasing amounts of dairy by-products available. With the last of the summer litters it may be necessary to feed some meal right through and to market the litters at pork weights.

### 15. Feed 3 times daily for 3 weeks after weaning.

The interval between sucklings of the newly born pig is about 1 hour and this period increases up to weaning. However, regular feeding 3 times daily for a few weeks after weaning is recommended. The meal may be fed wet or dry according to convenience and the means which reduces wastage to a minimum.

### 16. Feed pigs twice daily after they have been weaned for 3 weeks.

Trials indicate that pigs fattening on skimmed milk can safely be fed only twice daily; there is no appreciable loss of efficiency of feed conversion or growth-rate. Restriction of the ration to two-thirds of the levels shown in the table on page 128 will not affect efficiency of feed conversion, but will mean that pigs take longer to finish. Under selective grading restricted feeding would be worth while, as it would tend to improve grading results if it were imposed after the pigs had passed 100lb. deadweight.

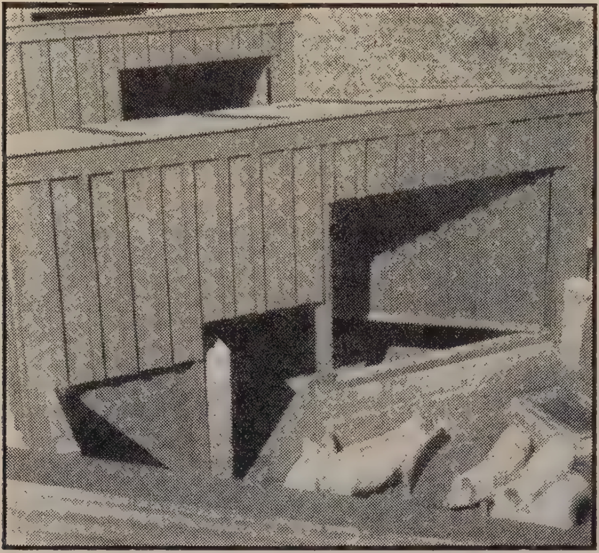
### 17. Market as much pork as the feed supply will permit.

As a means of adjusting pig numbers to the available feed supply and to exploit fully the present market for pig meat, it is advisable to give the production of pork priority in planning the management policy.

### 18. Keep pigs up to 100lb. liveweight at a temperature of 70 degrees F. inside the pig house.

Small pigs require more energy to maintain body temperature than do large pigs and to promote growth the

Sow with winter litter in good, warm bed. Sows should be farrowed 6 weeks before 20 per cent. of the dairy herd is due to calve.



Farrowing house, showing shutter for controlling temperature. A covered creep is next to the sleeping floor. The feeding yard enables the sow to be controlled.

demand on the food supply to maintain body heat should be minimised. Young growing pigs do best at temperatures round about 70 degrees F. Accommodation for fattening pigs should thus permit some control of the temperature and should always be comfortably warm.

### 19. Pigs over 100lb. liveweight should be kept at a temperature of 65 degrees F. inside the pig house.

A pig of over 100lb. liveweight can withstand and should be housed at a lower temperature than a smaller pig. Provision of a water spray over the concrete feed yard to keep down the air temperature in hot weather has much to recommend it.

### 20. Farrow sow 6 weeks before 20 per cent. of the dairy herd is due to calve.

Dependent as he is on a dairy by-product, the New Zealand pig farmer must make every endeavour to use that food supply to best advantage. Farrowing sows 6 weeks before 20 per cent. of the herd is due to calve will mean usually that in northern districts farrowings should be concentrated in May and early June, in central districts in June, and in southern districts in July.

This policy may call for additional supplementary foods, but meal fed to the litters before the milk supply is adequate will be used most economically and the spring flush of dairy by-products will not be wasted. It also means that two litters per sow annually are possible, the second of which can be marketed in autumn before the feed supply falls away. Even in a short dairying season the use of meals will enable second litters to be finished profitably as porkers.

## Ruakura No. 1 Ration

Ruakura No. 1 ration is the ration referred to in point 16. It represents the amount of food consumed by pigs on a largely skimmed-milk diet when they are fed as much as they will readily clean up. In hot weather, unless means are used to reduce air temperature, intake is reduced below these levels and growth slows up.

**RUAKURA No. 1 RATION**

| Liveweight of pig lb. | | Total f.u.* (or gals. of s. milk) per day | | Liveweight of pig lb. | Total f.u.* (or gals. of s. milk) per day | |
|---|---|---|---|---|---|---|
| 31-35 | If not enough milk, make up with meal | 1.5-1.75 | 4-5 feeds daily | 116-120 | 3.90 | 2 feeds daily |
| 36-40 | | 1.75-1.90 | | 121-125 | 4.00 | |
| 41-45 | | 2.00 | 3 feeds daily | 126-130 | 4.10 | |
| 46-50 | | 2.10 | | 131-135 | 4.25 | |
| 51-55 | | 2.25 | | 136-140 | 4.40 | |
| 56-60 | | 2.40 | | 141-145 | 4.50 | |
| 61-65 | | 2.50 | | 146-150 | 4.60 | |
| 66-70 | | 2.60 | | 151-155 | 4.75 | |
| 71-75 | | 2.75 | 2 feeds daily | 156-160 | 4.90 | |
| 76-80 | | 2.90 | | 161-165 | 5.00 | |
| 81-85 | | 3.00 | | 166-170 | 5.10 | |
| 86-90 | | 3.10 | | 171-175 | 5.25 | |
| 91-95 | | 3.25 | | 176-180 | 5.40 | |
| 96-100 | | 3.40 | | 181-185 | 5.50 | |
| 101-105 | | 3.50 | | 186-190 | 5.60 | |
| 106-110 | | 3.60 | | 191-195 | 5.75 | |
| 111-115 | | 3.75 | | 196-200 | 5.90 | |

* Food units. 1 f.u. = 1 gallon of skimmed milk = 1lb. of meal = 5lb. of sugar beet or artichokes = 8lb. of fodder beet or carrots = 10lb. of other roots or grass.

For best results inclusion in the ration for young pigs of up to 1lb. of meal per day at weaning and gradual reduction until no meal is being fed when the pig has passed 100lb. liveweight is recommended.

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# Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during March as follows:—

**1XH Hamilton, 12.33 p.m.**

5 March—"Tuberculin Testing of Cattle", by P. J. McCann, Veterinarian, Department of Agriculture, Hamilton.

12 March—"Pasture Improvement", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

19 March—"Meat from the Dairy Farm", by R. Woolerton, dairy section, Federated Farmers, Hamilton.

26 March—"Insect Pest and Disease Control", by C. E. K. Fuller, Horticultural Instructor, Department of Agriculture, Hamilton.

**1YZ Rotorua, 7.15 p.m.**

5 March—"Off-season Improvements to Milking Sheds", by E. P. Carter, Special Inspector, Department of Agriculture, Hamilton.

19 March—"A Few of the Seasonal Problems of Dairy Farmers in Rotorua District", by C. R. Taylor, Fields Instructor, Department of Agriculture, Rotorua.

**2ZA Palmerston North, 12.30 p.m.**

2 March—"Seasonal Stock Notes", by W. W. Hubbard, Livestock Instructor, Department of Agriculture, Palmerston North.

9 March—"Plant Nutrition", by L. H. Alsop, Fields Instructor, Department of Agriculture, Dannevirke.

16 March—"Rules to be Observed in Importing and Exporting Garden Plants and Seeds", by K. Stagg, Horticultural Inspector, Department of Agriculture, Palmerston North.

23 March—"Winter Work in and around the Milking Shed", by E. P. Carter, Special Inspector, Department of Agriculture, Hamilton.

30 March—Y.F.C. Session, by I. G. Tabor.

**3YA Christchurch**

5 March (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

9 March (12.20 p.m.)—"Livestock Disease Control Measures of Current Interest", by A. G. Brash, Veterinarian, Department of Agriculture, Christchurch.

16 March (12.20 p.m.)—"Pure Seed Production", by N. Shillitto, Seed Production Officer, Department of Agriculture, Christchurch.

26 March (7.15 p.m.)—"Current Work in the Vegetable Garden", by M. R. Porter, Horticultural Instructor, Department of Agriculture, Christchurch.

**Regular Sessions**

1XH Hamilton, Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (Report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (Waikato stock review).

1XN Whangarei, Mondays at 8 p.m., Wednesdays at 8 p.m. (Northland stock market report), Fridays at 8 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock review), fortnightly on Tuesdays at 12.33 p.m. (Federated Farmers' session), Tuesdays at 6.55 p.m. (Frankton stock market report), Thursdays at 12.33 p.m., Thursdays at 7.15 p.m. (farm talks alternating with session for Bay of Plenty farmers), fortnightly on Fridays at 12.33 p.m. (pig council talk).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m.

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8 p.m. (stock review).

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.33 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Tuesdays at 8 p.m., Thursdays at 8 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. and 7.15 p.m., Tuesdays at 7.15 p.m (Lorneville stock market report), Thursdays at 12.33 p.m.

HEADING PHOTOGRAPH: Harvesting lemons in a well-maintained orchard. National Publicity Studios photo.

# Lemon Orchard Practice in Relation to Packing House Costs and Fruit Wastage

ECONOMIC marketing of lemons depends on the production of sufficient fruit of a type which meets the consumers' requirements in appearance and quality. Equally important, however, for marketing is the keeping quality of the fruit. Loss from decay in storage and transit is reflected directly in a reduced return to each grower. The indirect loss caused by loss of confidence of the buyers is also of considerable consequence. A marketing organisation can easily obtain a reputation for fruit of poor keeping quality. It is believed that without any expensive investigation into obscure causes of trouble adequate attention in all orchards to the practices outlined in this article by W. A. Fletcher, Citriculturist, Department of Agriculture, Auckland, would considerably improve the general quality of lemons being received at packing houses.

UNDER any system of handling and marketing a perishable product some loss can scarcely be avoided. Nevertheless there is much unnecessary loss and expense in lemon-packing houses through the handling of dirty, blemished, inferior fruit, which has little market value and indeed is usually only an embarrassment to the marketing organisation.

## Manuring and Pruning

"Green" or "silver" lemons keep much better than coloured or tree-ripe fruit. The orchardist's aim, therefore, should be to bring as much of his fruit as possible to the required size green or silver. This is comparatively simple with young, healthy trees, but becomes increasingly difficult with older or neglected trees declining in vigour. Neglect of necessary manuring and pruning, particularly in some older orchards, is responsible for an unduly large proportion of the lemons harvested being tree ripe or coloured.

Much heavier applications of commercial fertilisers are necessary in many orchards if an improvement in the quality and quantity of fruit is to be obtained. A mature tree of 15 to 20 years should receive up to 25 to 30lb. of a complete mixed fertiliser annually, depending on the natural fertility of the soil. In addition liberal dressings of bulky organic manures or mulches should be made to restore and maintain a high humus level in the soil. Alternatively where possible winter cover crops should be grown between the trees and turned in in spring.

Fertilisers and manures alone, however, are usually not sufficient to restore the vigour of declining trees; in addition dead wood and worn-out lateral growth should be removed. More attention could be paid to the removal of worn-out laterals when fruit is being picked.

Lemon trees have remarkable powers of recuperation. Provided the trunk and main limbs are sound and the trees are not more than 15 to 20 years of age, even trees which have declined badly owing to malnutrition and neglect should repay the effort and expense of pruning, manuring, and other work needed to renovate them fully. Cutting in these circumstances usually needs to be severe, but without unduly interfering with the pruning as much healthy foliage as possible should be saved.

Other aspects of lemon culture such as cultivation and spraying must, of course, also receive attention if trees are to be maintained in a healthy, vigorous condition.

## Pest and Disease Control

Department of Agriculture Bulletin No. 20, "Recognition and Control of Citrus Pests and Diseases in New Zealand", can be obtained free from any office of the Department.

Spraying for pest and disease control is frequently neglected in many lemon orchards or the coverage is often insufficient. It is considered that 6 to 9 gallons of spray are necessary adequately to cover trees 10 to 15ft. high. If effective spraying was practised in all lemon orchards, an almost immediate improvement in the general quality of lemons received at the packing houses could be expected.

Factors affecting shed handling costs and wastage of lemons which are directly influenced by spraying are:—

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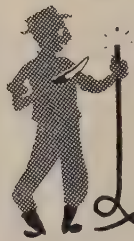

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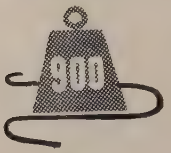
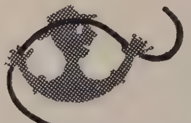


3 **Contour Pipe** can be connected to pumps, troughs, galvanised pipe etc. Bursting strength is as high as 900 lbs. per square inch. It will not burst under freezing conditions.



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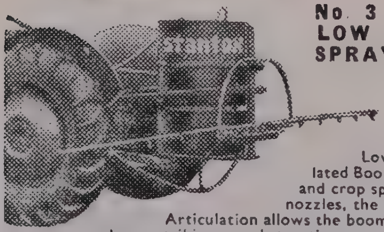

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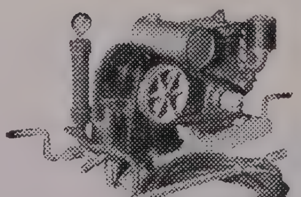
Low Volume 14′ Articulated Boom Sprayer for pasture and crop spraying. Using 12 fan nozzles, the boom covers 15 feet. Articulation allows the boom arms to swing backwards on striking an obstruction or upwards for travelling through gates, etc. This unit is designed to fit any make of tractor. Pump capacity 200 gallons per hour at 50 lbs. pressure.



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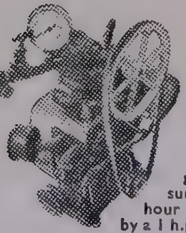
This High Pressure Unit is suitable for spraying large areas of Gorse, Blackberry, Broom, Lupin, Willows etc. Capable of operating two spray guns, it is ideally suited to contractors, County Councils, Catchment Boards, etc. Maximum capacity 240 gallons per hour at 350 lbs pressure with one spray gun. The heavy duty plunger-type pump is powered by a 2-2½ h.p. air-cooled petrol engine.



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Spraying with a tractor-drawn outfit. If effective spraying was practised in all orchards, an almost immediate improvement in the general quality of lemons received at packing houses could be expected.

**Stem-end rot of lemons:** This trouble is caused by various species of fungi, but mainly by *Phomopsis citri*, which is also responsible for the melanose disease of citrus. Up to 50 per cent. of the total losses of lemons due to decay in some years have been attributed to stem-end rots. This is essentially an orchard problem, and pre-blossom Bordeaux sprays would greatly reduce the incidence of this fungus on lemon trees.

**Other fungous diseases:** Much fruit is rejected or graded down in quality owing to verrucosis, melanose staining, glomerella, and other causes. Adequate spraying with Bordeaux mixture readily controls these troubles.

**Damage by pests:** Various pests blemish fruits and may often reduce the vigour of lemon trees. Common blemishes are thrips scars, leaf-roller caterpillar holes, katydid wounds, and red mite damage. Fruit covered with red scale has poor keeping quality and also requires extra expense in cleaning. Little difficulty is experienced in controlling these pests if the recommendations in the spray programme on page 132 are carried out.

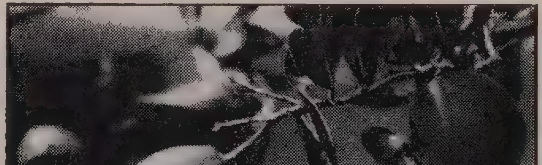
**Sooty mould:** This causes considerable cost in time and shed equipment in the handling and cleaning of affected fruit. The fungus follows and grows on the excretions of scale and other insects such as aphides. Effective control of the insects will eliminate sooty mould.

## Harvesting and Handling

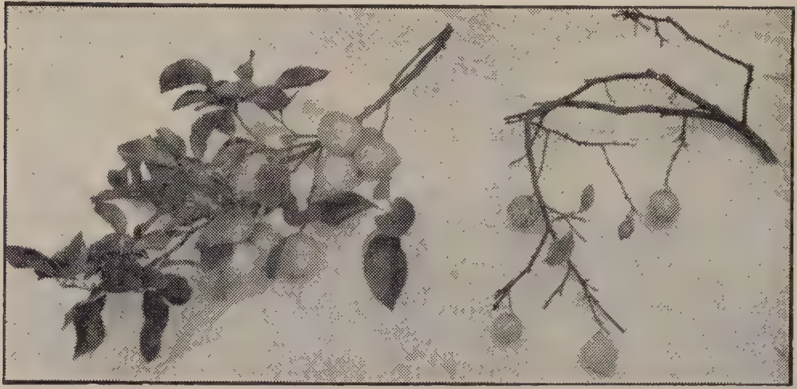
Much otherwise good fruit is ruined by avoidable mechanical injury. Most growers fail to realise the magnitude of losses resulting from such causes. Careless handling is the chief cause of all wastage, and it is well known that careful handling of lemons can reduce or practically eliminate wastage caused by green mould.

The following points in regard to picking of fruit have been repeatedly stressed, yet greater care is still needed.

1. Pickers overseas wear gloves to avoid finger-nail injuries, a practice not general in New Zealand. If gloves are not used, pickers should ensure that their finger nails are cut short.
2. Clippers used for picking should be sharp with rounded points to avoid cutting the fruit.
3. Stems should be cut flush with buttons to avoid puncturing other fruit in the box. Fruit is still being received from orchards where this is not done.
4. Lemons should be carefully placed in the picking bag and care should be taken to avoid injuring them with branches and ladders or other equipment.
5. Where ladders are being moved care is necessary to avoid bruising or scratching fruit.



The proper way to pick a lemon. The stem is cut flush with the button in two stages. Clippers with rounded points should be used.



[*Sparrow Industrial Pictures Ltd. photo.*

Healthy and strong fruiting wood on left and a worn-out lateral on right. Worn-out laterals should be removed from trees.

6. Lemons should be rolled very gently out of picking bags into the bottoms of cases and not be allowed to drop from the top edge.
7. Care should be taken to exclude sand, twigs, and other trash from field cases and picking bags.
8. Field cases should be kept in good repair and free from protruding nails, splinters, and other rough projections.
9. Field cases should not be over-filled.
10. Field cases should be occasionally sterilised with boiling water.
11. If possible, picking immediately after stormy weather or heavy wind should be avoided.
12. Field cases when filled should be covered in the orchard to protect the fruit from strong sun; they should be removed to a clean dry position as soon as possible after picking of the fruit and not left lying about for several days until a whole block has been picked.

**GENERAL SPRAY PROGRAMME FOR CITRUS**

| Period of application | Treatment | To control |
|---|---|---|
| Pre-blossom of main crop (October) | Bordeaux mixture 3 : 4 : 50 | On Lemons: Verrucosis, melanose, grey scab, wither tip, citrus blast |
| Petal fall of main crop (late November or early December) | Bordeaux mixture 3 : 4 : 50<br>D.D.T.* (50 per cent. para para isomer) 1lb. to 100 gallons, or<br>Acid lead arsenate 1½lb. to 100 gallons | On all citrus: Verrucosis, melanose, grey scab, wither tip<br>Dicky rice weevil (skirt spray), leaf-roller caterpillar, katydid<br>Leaf-roller caterpillar only |
| Early January | Bordeaux mixture 3 : 4 : 50<br>D.D.T.* (50 per cent. para para isomer) 1lb. to 100 gallons, or<br>Acid lead arsenate 1½lb. to 100 gallons | On all citrus: Verrucosis, melanose, grey scab, wither tip<br>Dicky rice weevil (skirt spray), leaf-roller caterpillar, katydid<br>Leaf-roller caterpillar only |
| Early February† | Summer oil 3 per cent.; nicotine sulphate (1 pint to 100 gallons) | On all citrus: Red scale, soft wax scale and hard wax scale, etc., and thrips, black aphis, red mite, and mealy bug |
| 3 to 4 weeks later† | Summer oil 3 per cent. | On all citrus: Red scale, soft wax scale and hard wax scale, etc. |
| May | Summer oil 1½ per cent.<br>Bordeaux mixture 3 : 4 : 50 | On all citrus: Hard wax scale<br>Citrus brown rot, verrucosis, citrus blast, wither tip |
| Four weeks later | Bordeaux mixture 3 : 4 : 50 | On all citrus: Citrus brown rot |

* D.D.T. sprays are recommended only for orchards where dicky rice weevils or leaf-roller caterpillars are troublesome. Two applications are suggested—one in late November or early December and another in early January. For dicky rice weevils skirt sprays up to about 3ft. from the ground are sufficient. For control of leaf-roller caterpillars, particularly on New Zealand grapefruit and sweet oranges, full tree coverage is necessary. It is possible that D.D.T. may be lethal to the natural enemies of mites and scales and so cause a build-up in the population of these pests on the trees. It is therefore recommended that D.D.T. should not be used unless it is necessary for the control of dicky rice weevils or leaf-roller caterpillars. If D.D.T. is used, summer oil sprays should be applied to control scales or mites as soon as they appear.

† The use of 3 per cent. summer oil in early February and 3 to 4 weeks later is primarily for control of red scale. This is a good time to control soft wax scale and other scales also. In the absence of red scale and soft wax scale one application of 1½ per cent. summer oil in May will control hard wax scale. The addition of nicotine sulphate 1 pint to 100 gallons to one of the 3 per cent. summer oil sprays will control additional pests such as thrips and aphides. As it may be necessary to control thrips and aphides at other times of the year, the specific treatments are given below:—

1. **Red mite:** 1 per cent. summer oil, repeated in 10 days if the infestation is severe.
2. **Thrips:** 1 per cent. summer oil plus nicotine sulphate 1 pint to 100 gallons.
3. **Aphides:** 1 pint of nicotine sulphate plus 4lb. of soft soap to 100 gallons.

## Propagation of Trees

Much fruit now forwarded to the lemon packing houses has abnormally long necks and persistent styles and is otherwise coarse, rough, or mis-shapen owing to the fact that many producing trees are of poor strains. When contemplating planting of new blocks of lemon trees growers should ensure that their trees are propagated with budwood taken only from trees producing high-quality fruit. The Department of Agriculture can be of assistance to growers in locating sources of budwood from trees of superior strain.

## Citrus Specialisation Desirable

Many lemon growers are also concerned with other forms of agriculture which are often regarded as being more important than their citrus growing. This attitude probably accounts in great part for the lack of necessary attention to the points mentioned in this article. It is considered that for best results and progress more orchardists should specialise in citrus growing. Many of the present lemon groves are far too small to be economic units, a factor which also contributes to lack of adequate attention to necessary orchard practices.

There is no doubt that efficient distribution of lemons can be achieved only by an organisation which possesses full information about supplies of fruit available and market requirements of grades, sizes, and the amount necessary to supply normal demand. Growers for their part need to provide adequate supplies of lemons which are juicy, of attractive appearance, and of good keeping quality. This type of fruit is undoubtedly the most profitable to market and is also much less trouble to handle in the packing houses. It is therefore in every grower's interest that he produce good crops of this high-quality fruit and share in increased benefits not only from the better prices which could be received, but also from a reduction in handling expenses and losses from decay occurring between the orchard and the consumer.

## Value of Lucerne

Department of Agriculture Bulletin No. 155, "Lucerne", has been reprinted recently with revisions and an additional section on trends in lucerne production for hay and silage.

The bulletin stresses the value of lucerne as a general fodder crop, especially its importance as a reliable standby in periods of drought when practically all other crops fail. Useful information to aid successful production describes the desirable soils and situations, seed-bed preparation, seed strains, manurial treatment, and cultivation practices.

Copies of the bulletin are obtainable free from the nearest office of the Department.

# Rotation of Crops and Hygiene in the Home Garden

**IN the home garden plants are congregated and subjected to conditions which may or may not be congenial to them. The aim of the gardener should be to provide for his plants conditions in which they can thrive and produce satisfactory crops. Where the size of the garden is limited, the problem of how best to obtain maximum production can become difficult. Protection from wind, soil drainage, cultivation, and disease control all have their effects on the crops, but in this article the factors discussed are rotation of crops and garden hygiene, including dealing with pests such as slugs and snails which are not normally controlled by spray applications. The first part of this article is by J. T. McConachie, Horticultural Inspector, Department of Agriculture, Auckland, and the section on work for the month by C. L. Napier, Horticultural Instructor, Department of Agriculture, Hastings.**

CROP rotation is the practice of planting different kinds of crops in the land in successive seasons. If possible, the same crop is not grown in any one place for 2 to 3 years. The underlying principle is that different types of plants require different proportions of plant foods from the soil and for that reason the balance of plant foods is more satisfactorily maintained if different crops are grown from year to year. Each crop in turn takes from the soil the quantities of mineral elements required for its particular development. If a crop demanding, for example, large quantities of phosphate and smaller proportions of elements such as nitrogen and potash is grown for a number of seasons in the same position, there is a tendency for the soil to become deficient in phosphate and for the quantities of nitrogen and potash to become excessive in proportion. By rotation of crops that tendency is substantially corrected. It is necessary, of course, to maintain the soil fertility by the addition of plant foods to the soil because, even with rotation of crops, the total mineral content is gradually reduced and the soil eventually becomes poor.

Where large areas are available, particularly in places where populations are relatively small, it is often possible to grow crops on a plot of land for a few years and then move the garden to another area. The original plot is allowed to go back to grass for a period to enable organic and other materials to build up and to restore the fertility of the soil. Unfortunately that practice cannot be used for small gardens where the owner hopes to produce vegetables annually over many years. However, good cultural practices and the replenishing of supplies of soil nutrients make it possible to use the same soil indefinitely for crop production.

## Major and Minor Elements

The fertility of soils generally may be maintained for a considerable number of years by adding the major plant foods, nitrogen, phosphorus, and potash, together with organic matter in quantities and proportions which experience has shown are suitable. The elements of which plants require only small amounts are usually present in the soil in sufficient quantities to last for a considerable number of years, but it has been found that deficiencies tend to appear after long terms of cultivation. Signs of these deficiencies are shown by symptoms such as chlorosis of leaves, dying of shoot tips or the edges of leaves, and stunting of plants. Such symptoms may be the result of a deficiency of one particular element or of several. They may also appear as a result of an over-supply of an element in proportion to the quantities of other plant foods available. Over-supply can usually be corrected by increasing the applications of other elements and refraining from adding the material which has built up to more than its normal proportion in the soil.

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HEADING PHOTOGRAPH: In gardens of limited size the positions of vegetables of a particular type should be changed regularly if the best results are to be achieved. Sparrow Industrial Pictures Ltd. photo.

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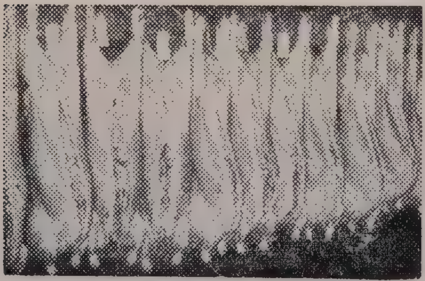

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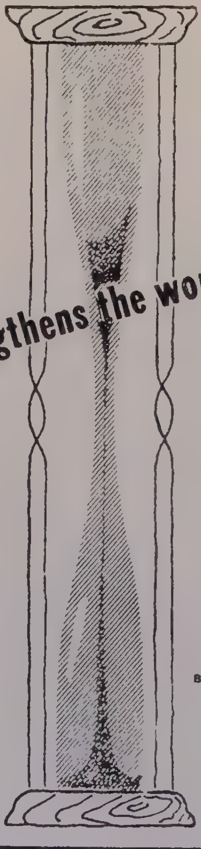

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Deficiency diseases are not easy to describe, because of the complex nature of their causes and the different appearance caused by the same deficiency in various kinds and varieties of plants. Common examples of deficiencies are internal cork of apples, cracked stem of celery, and brown heart of swedes, all indicating boron deficiency; whiptail of cauliflower (molybdenum deficiency); and chlorosis of bean leaves, which may be caused by magnesium deficiency.

## Rotation System

Lack of balance in the plant food in a garden soil can become apparent more quickly if the same plants are grown in the soil for a number of years than if rotation of crops is practised. A good system to assist in maintaining a satisfactory rotation is to divide the garden into a number of plots and to grow different groups of vegetables in each plot. In successive years the groups are grown in different plots.

Vegetables such as asparagus, rhubarb, and some of the herbs cannot be grown in an annual rotation, because the beds last for a considerable number of years. It is necessary, therefore, to provide a special section for such crops and to give particular attention to the maintenance of fertility in that section so that deficiencies do not appear.

The diagram below shows an example of a vegetable garden layout that may be modified to meet the shape and size of plots available on any section. The range of vegetables to be grown depends to some extent on the owner's personal preferences and therefore rigid recommendations for rotation cannot be laid down to meet all circumstances. Generally it is possible for any one of the vegetables shown in the suggested layout to be replaced by another of some similar type. The following classification of vegetables into groups should be of assistance in working out rotations:—

**Greens:** Broccoli, brussels sprouts, cabbage, cauliflower, kale, silver beet, spinach.

**Gourds:** Marrow, pumpkin, squash.

**Herbs:** Mint, marjoram, chives, parsley, thyme, sage.

**Pod bearers:** Beans (all kinds), peas.

**Root crops:** Beetroot, carrot, parsnip, turnip, swede, onion.

**Salads:** Endive, cress, cucumber, lettuce, mustard.

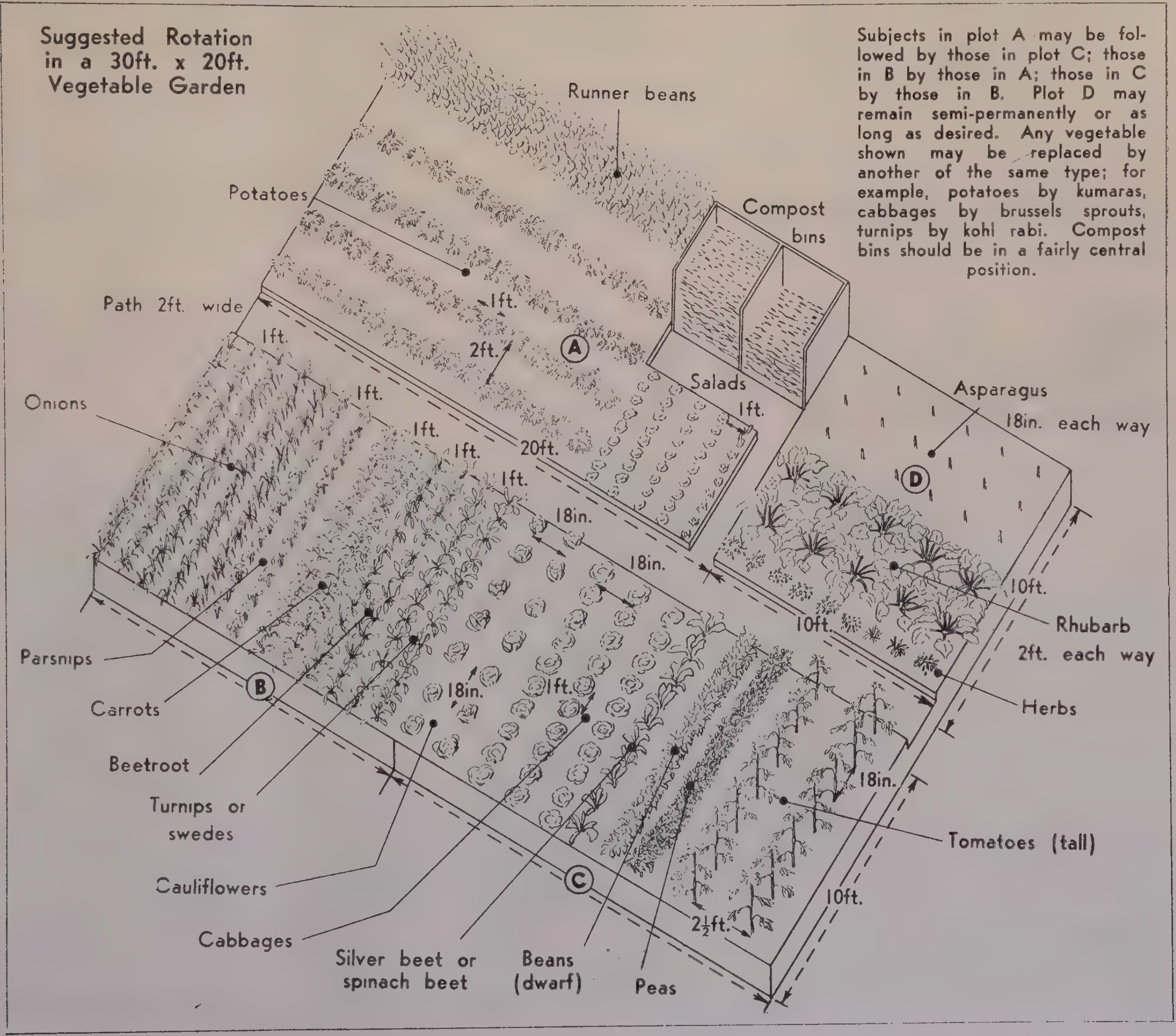
**Stem and leaf stem:** Asparagus, celery, chicory.

**Tubers:** Artichokes (Jerusalem), kumaras, potatoes.

**Miscellaneous:** Tomato, egg plant, sweet pepper, sweet corn.

The garden in the diagram is divided into four plots, one of which (D) is reserved for the semi-permanent vegetables such as artichokes, asparagus, rhubarb, and herbs. It is often best to grow herbs at the edges of pathways so that they may be readily accessible for harvesting.

The remaining three plots are intended to be used for annual crops. It is suggested that the first of these plots (A) should be planted with a tuberous crop; that the second (B) may be lightly manured and used for root crops such as carrots, parsnips, etc., which produce better-quality crops with smaller quantities of fertilisers; that the third (C) should be well manured for such crops as celery, beans, peas, cabbage, cauliflower, or spinach, all of which


Suggested Rotation
in a 30ft. x 20ft.
Vegetable Garden

Subjects in plot A may be followed by those in plot C; those in B by those in A; those in C by those in B. Plot D may remain semi-permanently or as long as desired. Any vegetable shown may be replaced by another of the same type; for example, potatoes by kumaras, cabbages by brussels sprouts, turnips by kohl rabi. Compost bins should be in a fairly central position.

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Two excellent hiding places for snails during hibernation or in daytime. Left—Unsuppressed weed growth. Right—Bricks loosely stacked about the garden.

demand a high level of fertility for good results.

Forked and otherwise misshapen roots are often produced if root crops are grown in soil containing excessive quantities of undecomposed organic matter or large quantities of fertilisers. It is best to grow root crops in soils which have been manured heavily for a previous crop and to which comparatively small quantities of fertiliser are added for the root crop. The following are examples of suggested vegetable crop rotations based on a 3-year cycle:—

| First crop | Second crop | Third crop |
|---|---|---|
| Artichokes, kumaras, potatoes | Broccoli, cabbages, cauliflowers | Beetroot, carrots, onions |
| Beans, broad beans, peas | Carrots, parsnips | Leeks, celery |
| Cabbages, cauliflowers, broccoli | Pumpkins, marrows, melons | Lettuces, broad beans |
| Celery, leeks | Tomatoes | Cabbages, broccoli, cauliflowers |
| Beetroot, onions, turnips, swedes | Spinach, silver beet, lettuces | Tomatoes |
| Rhubarb | Beans, peas | Lettuces, spinach |
| Silver beet, spinach | Sweet corn | Broad beans, cabbages |

[*R. W. Orr photo.*

Generous spacing of plant rows facilitates inter-row cultivation and provides good aeration among growing crops.

In very small home sections the division of the vegetable garden into separate plots for crop rotation is not practical, but a fairly satisfactory rotation is possible simply by avoiding successive plantings of similar vegetables in any one position.

Because crop rotation requires vegetables to be grown in different positions each year, it is desirable to have rows of vegetables running north and south if possible. Grown in that direction the plants receive maximum sunlight and tall crops shade the lower-growing kinds less than if rows run east and west. Shade can be avoided by planting tall crops always at the south end of a plot, but satisfactory rotation cannot be practised that way.

## Garden Hygiene

The extent to which good garden hygiene is practised can have a considerable influence on vegetable crops Unless cleanliness and sanitation are maintained at a satisfactory standard, gardens can become little more than breeding grounds for plant diseases and pests. Tidiness in itself is obviously an advantage, but is not necessarily sufficient. The aim of a good gardener should be not only to keep his section tidy, but to see that breeding and harbouring places for diseases and pests are eliminated as far as is reasonably practicable. It is a poor policy to allow diseases and pests to gain a strong hold in the garden and then to attempt to control them with sprays. A far better practice is to keep weed growth under control and thereby allow better air circulation. That in turn discourages the propagation of many fungous diseases which require moist conditions to develop quickly. By destroying weed growth and by cleaning up stones, odd boards, and rubbish under hedgerows, etc., hiding places for such pests as slugs, snails, and earwigs are reduced. Consequently the attacks of those pests are kept to a minimum because the numbers close to the garden are smaller.

The making of compost in bins is one way of disposing of much of the rubbish which normally accumulates in vegetable gardens. Obviously such things as tins and bottles, stones, etc., should not be put in the compost bins, but all organic material can be disposed of in that way and ultimately used for the benefit of the growing crops. Rubbish in an untidy heap is a breeding ground for flies, in addition to being protection for garden pests, but if properly constructed compost bins are used, there is no need for the rubbish to be offensive in any way.

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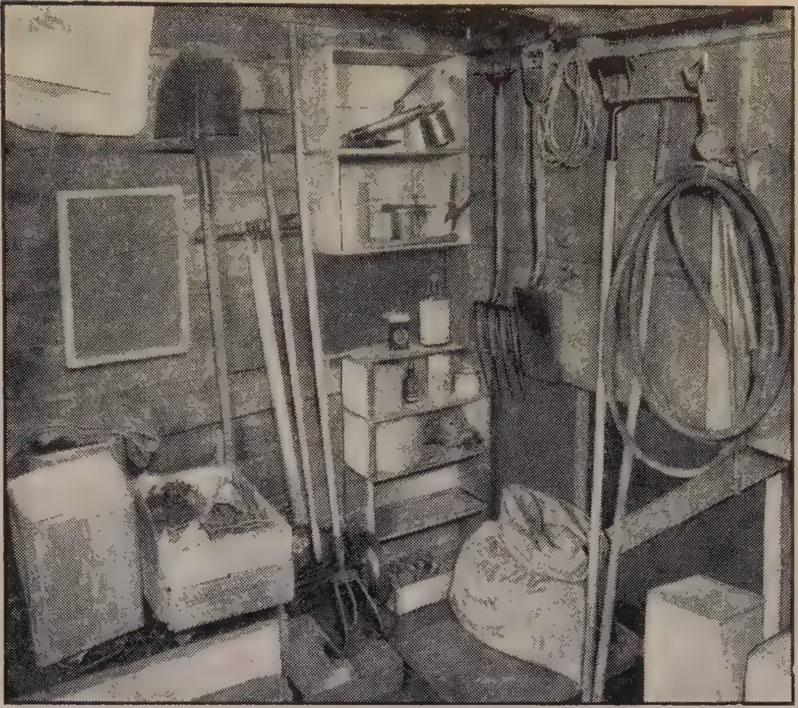

[*Green and Hahn Photography Ltd. photo.*

Thorough cleaning of all tools after use and general hygiene in the tool shed reduce the spread of disease organisms.

**Shelter Should not Harbour Pests**

It is essential that gardens should be reasonably protected from strong or cold winds, and that protection is usually in the form of a hedge or possibly a rock wall, but the means of protection should not become a harbour for pests. Weeds and rubbish growing in hedgerows should be kept under control just as they are in the garden. Rock walls should be "pointed", that is, the spaces should be sealed with concrete if that is possible. If not, every precaution will have to be taken to dispose of slugs, snails, and possibly mice and rats, which are likely to nest in the spaces.

Shelter hedges may have to be sprayed from time to time to control scale insects, some of which will attack garden crops as well as hedges.

Another good reason for destruction of weed growth is that many weeds are hosts of various diseases which also attack some of the cultivated vegetables. Virus diseases cannot be controlled by any spray or other means and consequently can be reduced only by eliminating host plants as much as possible, destroying insect carriers (such as thrips and aphides), and growing resistant varieties of vegetables.

Despite all efforts to control them, such pests as slugs, snails, woodlice, and earwigs will always be found, because it is quite impracticable to destroy all of their hiding places. Hedges, walls, buildings, and even the vegetable plants provide some protection, and creeping plants such as climbing fig and ivy on walls are favourite haunts. Consequently, it is necessary to use additional precautions, of which the most effective are poison baits and D.D.T. dust.

There are a number of very satisfactory proprietary baits for control of slugs and snails. An excellent bait can be made by mixing 1oz. of powdered metaldehyde in 3lb. of slightly moist bran. The bait may be broadcast thinly or placed in small heaps about the garden, particularly on mild evenings after rain. A very effective way of dealing with snails is to collect them as they emerge from their hiding places on damp evenings, when they are easy to find. The snails may be put in a bucket and destroyed by pouring hot water or salt solution over them, or they may be crushed where they are found.

A suitable bait for killing earwigs can be made by mixing 2oz. of sodium fluosilicate into 1½lb. of bran and then stirring 5 fl. oz. of fish oil into the mixture. The bait should be scattered thinly over the area affected.

The best way to deal with woodlice is to dust around their hiding places with 5 per cent. D.D.T. dusting powder.

Rotation of crops and garden hygiene will not solve all of the vegetable garden problems, but the former will contribute by helping to make the best of soil fertility, and the latter will help to keep the crops healthier and to protect them from injury by pests.

[*Green and Hahn Photography Ltd. photo.*

Winter vegetables should not be omitted from the planting programme this month.

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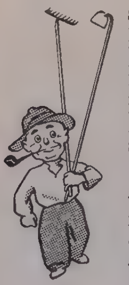
## Work for March



In many districts summer cropping is completed in March and winter vegetables come into prominence. All plots cleared and not required for replanting immediately should be sown down to a legume (lupins or peas), a cereal (barley or oats), or a vetch. Harvesting of crops for winter use will occupy a great proportion of the gardener's time this month, and if stored crops are to keep well, harvesting must be done thoroughly.

### Bulb Crops

Onions and shallots should not be pulled before the tops begin to turn brown. They are best pulled and left in the open to mature, provided the weather is fine. Roots and tops should be completely withered before bulbs are stored and selection for storage should be done carefully. Only undamaged and well-matured onions with thin necks should be kept and

[*Green and Hahn Photography Ltd. photo.*

All vacant plots not required for immediate planting should be sown to a green crop. That shown is barley.

others can be used immediately. Bulbs can be stored in shallow trays or on strings in cool, dry conditions. Shallots should be separated and sorted before storage and the best bulbs put aside for the next crop.

## Vine Crops

Although marrows store successfully, they are more attractive when used before they mature. Pumpkins and squashes, however, store best when fully mature and usually are more appetising then. Proper maturity of fruits is most important if they are to keep. They should be left on the vine until the stalks are brown and withered (provided weather conditions are suitable) and then be cut off with a small portion of vine attached. Stalks can be trimmed later, but a short portion should be left attached to each pumpkin. Pumpkins and squashes are best stored on shelves or in boxes on their sides in warm, dry conditions.

## Potatoes and Kumaras

Potatoes and kumaras should be lifted carefully. Potatoes should be thoroughly ripened and without blemishes if they are to store successfully. Potatoes should be dry before being stored; sacks, boxes, or clamps under cool, moist (not wet) conditions can be used.

It is difficult to get kumaras in correct condition for lifting, but they are best lifted before frost cuts the tops. It is advisable to leave tubers in the open for a few fine days for the skins to toughen. They should then be sorted carefully, damaged tubers being put aside for early use. Kumaras can be stored in sawdust or dry sand in shallow boxes.

## Root Crops

In some districts root crops can be left in the ground over winter, but where weather conditions do not retard growth the roots may become woody and useless if left too long. Roots require to be lifted and sorted carefully before storing. They are best placed in clamps outdoors, as under these conditions they do not wither. Pits lined with straw or sacking in a high spot in the garden are excellent. All but a few inches of the tops should be removed. Beetroot stores successfully, but the tops should be screwed, not cut, off so that bleeding is reduced to a minimum. Roots for storage should be lifted in prime condition and stored in moist, cool conditions.

## Plantings

In the North Island brussels sprouts, winter cabbage, silver beet, and cauliflower plants can still be set out; also the last of the leeks, celery, kale, and kohl rabi. Suitable varieties were given in last month's notes.

## Sowings

Red and silver beet, spring cabbage, lettuce, spinach, and turnips can all be sown this month, the last more particularly in favourable localities. The first sowings of onions can also be made. Good varieties are Ailsa Craig and Straw Spanish (early) and Pukekohe Long Keeper (main crop). Onions should be sown in weed-free soil that will not become too wet during the following months. Broad beans (Broad Windsor, early, and Long Pod) can be sown in favoured localities. Cauliflowers and early varieties of carrots can still be sown in the North Island. This will probably be the last opportunity to sow carrots. Suitable varieties were given in last month's notes.

## Other Work

Any surplus organic matter from cleared plots should be composted, but badly diseased plants are best destroyed so that the diseases are not carried over to subsequent crops. Plots should be dug over and sown to green crops.

All fruiting crops such as peas, beans, tomatoes, marrows, and cucumbers should be harvested regularly, but if frosts are expected, tomatoes and any other frost-tender vegetables should be covered at night to prevent damage.

Early-planted celery and leeks may require earthing up now to blanch the stems. If celery is planted closely (about 8in. apart each way) in a block, it does not require earthing.

When necessary, cultivation should be done to eliminate weeds. At this time of year showers may be more frequent and cultivation and other work should be done when soil conditions allow. Working on the soil when it is wet helps to break down its structure and makes it more difficult to work.

Slow-growing crops may have to be stimulated by applications of liquid manure. Sprays to check pests and diseases may be required.

When asparagus fern growth turns brown it is losing its usefulness and should be cut down and destroyed. Beds can then be renovated by eliminating weeds and mulching with stable manure.

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# A. and P. Show Dates

THE following are dates and venues of A. and P. shows up to 11 April:—

**February**

24 February—Otorohanga A. and P. at Otorohanga.

25 February—Opotiki A. and P. at Opotiki.

26 February—Matamata A. and P. at Matamata.

*27 and 28 February—Wellington and Hutt Valley A. and P. at Upper Hutt.

28 February—Putaruru District A. and P. at Putaruru.

28 February—Waimarino A., P., H., and I. at Raetihi.

28 February—Whakatane and Rangitaiki A. and P. at Whakatane.

28 February—Maniototo A. and P. at Ranfurly.

**March**

*4 March—Morrinsville A. and P. at Morrinsville.

*6 and 7 March—Te Kuiti and District A. and P. at Te Kuiti.

7 March—Amuri A. and P. at Rotherham.

7 March—Waiotira A. and P. at Waiotira.

*7 March—Temuka and Geraldine A. and P. at Winchester.

7 March—Albany A. and P. at Albany.

7 March—Mt. Benger A. and P. at Roxburgh.

7 March—Mangonui County A. and P. at Kaitaia.

10 March—Lake County A. and P. at Arrowtown.

14 March—Waikato Central Agricultural Association at Cambridge.

*14 March—Kaikoura A. and P. at South Bay.

14 March—Hawkes Bay A. and P. Autumn Show at Hastings.

*14 March—Kumeu District A. and H. at Kumeu.

14 March—Upper Clutha A. and P. at Wanaka.

*21 March—Cheviot A. and P. at Cheviot.

21 March—Mayfield A. and P. at Mayfield.

23 March—Wellsford A. and P. at Wellsford.

28 March—Hawarden A. and P. at Hawarden.

28 March—Methven A. and P. at Methven.

28 March—Flaxbourne A. and P. at Ward.

**April**

6 April—Mackenzie County A. and P. at Fairlie.

6 April—Strath-Taieri A. and P. at Middlemarch.

11 April—Oxford A. and P. at Oxford.

* The Department of Agriculture exhibit will be staged at this show.

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HEADING PHOTOGRAPH: Much of the cultivated area of North Otago is of a broken, rolling nature where aerial topdressing could compete with surface distribution. This view from the Ngapara-Georgetown road shows Queen's Flat, an area highly molybdenum responsive.

# Oversowing and Topdressing North Otago Hill Country

ALTHOUGH the greatest increases in primary production are to be obtained from the application of scientific methods and the raising of the standard of the less efficient farmer on the potentially high producing farmlands to somewhere near average efficiency, there are many areas of hill country awaiting development. The possibilities of developing some of the more responsive hill country in North Otago by oversowing and topdressing are discussed in this article by W. R. Lobb, Instructor in Agriculture, Department of Agriculture, Oamaru.

WAITAKI County comprises mainly hilly country with the exception of the Waitaki Plain. The use of the aeroplane for distribution of seed and fertiliser has improved hill country, but it should not be thought that this method of land development applies only to areas "out back" or to improving hitherto undeveloped tussock grassland. The aeroplane can compete favourably with other methods of fertiliser distribution on almost any type of land. For those farmers who have broken or steeply rolling land suitable for cultivation only by track-laying tractors aerial distribution of fertiliser is possibly the most efficient method of application and not unduly costly by comparison.

The following types of hill country occurring in North Otago warrant consideration for aerial topdressing:—

(a) Steep areas of good land which cannot be improved by cultivation.

(b) Small areas comprising gullies and steep faces on many farms.

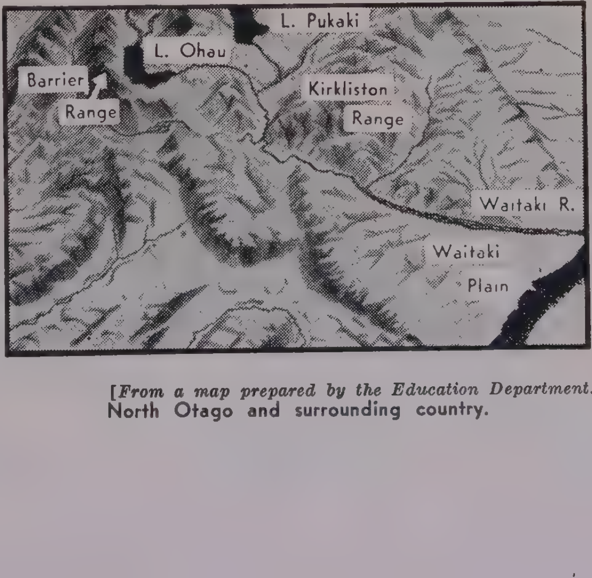
(c) Rolling areas of second-class land which require fertiliser.

(d) Some tussock grassland held in large blocks.

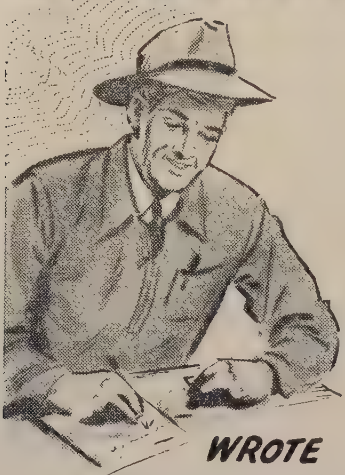
In addition aerial sowing is practicable on young pastures and lucerne crops where heavy tractors and lorries would cause damage on soft ground.

The oversowing of seed and the use of fertiliser on many of the rough faces of good land would give beneficial results, as would the improvement of some of the steep faces and gullies which show a tendency to erode. Perhaps the two largest areas awaiting development comprise, first, the foothill country on which browntop has become dominant, and, second, the highly responsive tussock country below the snow tussock levels.

Certain factors must be considered before successful results can be secured. In the first place it is necessary to know whether the soil is responsive to applications of phosphate. By far the greater area of hill country in North Otago is phosphate responsive. On some areas low rainfall is a factor which would limit production to the extent of precluding topdressing at this stage. Where, however, rainfall is average, as along much of the foothill country of Herbert, the northern aspect of the Kakanui Range, the Kirkliston foothills, and on the higher-rainfall areas further inland and north-west of Omarama, as on the Barrier Range, quite good results can be expected.



[*From a map prepared by the Education Department.*
North Otago and surrounding country.



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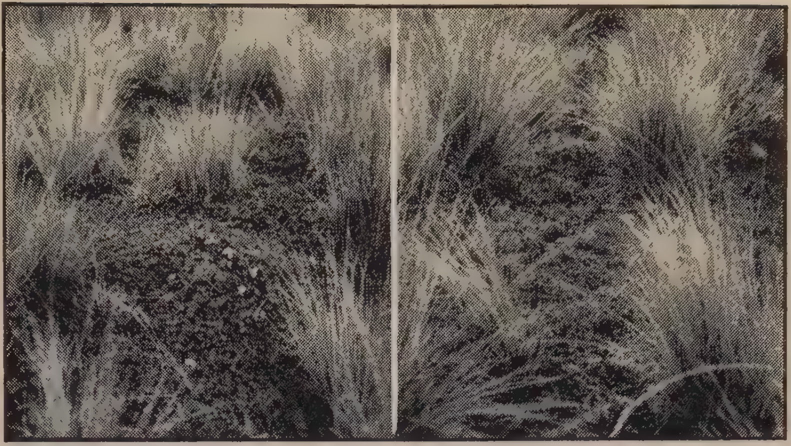


Comparison between topdressed tussock country (left) and tussock country not topdressed (right) on the Kirkliston Range.

In North Otago it has been found that it is also necessary to know whether the molybdenum status of the soil is a more important limiting factor than is the available phosphate status. This has been found true of a large area on Herbert, Kauru Hill, Tapui, and surrounding districts, and application of phosphates plus molybdenum becomes necessary. Whether such a mixture can be distributed efficiently from the air has yet to be established, but several extensive blocks aerially sown are being kept under observation.

Another necessary factor is the establishment of a plant which can make use of the fertiliser applied. The greatest benefit to be derived from adding phosphate or molybdenum or a combination of the two is dependent on having present or being able to introduce into the sward the correct amount of clover. The hill country swards in North Otago, whether browntop, chewings fescue, danthonia, or tussock species, are extremely deficient in clovers. It is useless therefore adding fertilisers on these areas unless clovers can also be introduced satisfactorily.

As most of these soils are very low in phosphate and as clovers require a satisfactory phosphate level, it is seldom any use introducing clovers to these swards without adding the necessary phosphates. It is also true that where molybdenum limits establishment it is necessary to make this addition.

## Responses to Phosphates

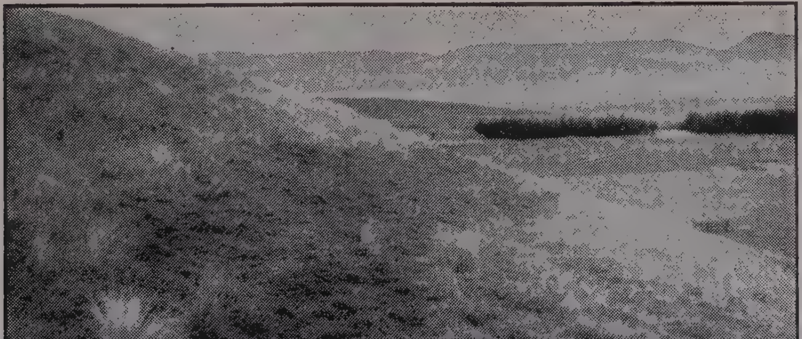
Over the past year or two some remarkable responses to phosphates with the oversowing of clovers have been secured in North Otago. These responses are illustrated on this page.

The illustration below of a view of the foothills on the Hakataramea Valley side of the Kirkliston Range shows the effect of oversowing a dense mat of chewings fescue with superphosphate, lime, and seed. In it a strip is shown where the topdresser was taken round a hill face of the fescue block. The strip is dominant white clover, whereas on either side there is a densely overgrown mat of fescue. This oversowing was done in the middle of winter and was so successful that a clover seed crop was taken the following year.

On the left of the illustration above is shown the effective establishment of clovers that were also sown in winter on the tussock country in the same locality. At the right of the same illustration is shown tussock land where no oversowing has taken place. In the area some equally spectacular results have been obtained by the aerial sowing of superphosphate and seed. The illustration on the right shows foothill country of the Barrier Range and illustrates the effectiveness of aerial sowing of phosphate and seed on previously unthrifty tussock country. These soils are obviously very responsive to phosphate provided a satisfactory establishment of clover can be secured at the same time.

There is a considerable area of this type of country in North Otago. It is estimated that there is a total of 104,000 acres south of the Waitaki River and east of Kurow, extending up to approximately 3000ft. elevation along the ranges bounded in the south by the Kakanui Range. There are probably some 80,000 acres along the Kirkliston Range and an equal area further inland along the Barrier Range. There are probably 200,000 acres of fairly step rolling land lying within the arable farming block of the district responsive to phosphates, and aerial topdressing will in time extend on to this country.

Dense clover growth in topdressed tussock on the Barrier Range.



Dominant white clover growth that has resulted from topdressing a strip round a face of dense fescue on the Kirkliston Range.

In the past two seasons over 1000 tons of phosphate and more than 10 tons of seed have been distributed on this type of country by aircraft. Last winter much interest was shown in the work, and aerial topdressing has been carried out on some of the easy rolling country.

## Suitability for Topdressing

Several factors apart from economic considerations govern the suitability of the areas to be topdressed. These are rainfall, absence of rabbits, present cover, and time of application. On very low rainfall areas or hot, dry, exposed faces it is difficult to obtain seedling establishment, as there are not at the

Upper—Kauru Hill and surrounding country. The rolling country in the foreground is markedly responsive to phosphates, the application of which is necessary to maintain sown pasture. On this country molybdenum responses have also been good. Middle—North Otago's arable land is broken. This view from the Airedale ridges shows gullies and slopes many of which in the past were ploughed right to the bottom. When conditions are unsuitable for heavy wheeled machines these areas could be quickly and readily topdressed with phosphates from the air. The gullies will not be ploughed again because of the advent of the tractor and many could be improved by oversowing clovers and by topdressing. Lower—Molybdenum trial plots on clay soils which have been treated with sodium molybdate at rates ranging from ⅛ to 2½oz. per acre. In the background is the scrub and browntop country of the Herbert foothills, which is composed predominantly of thin soils overlying clay that cannot be maintained without adequate phosphate. Molybdenum might be of great importance in developing this area.

farmer's disposal suitable legumes, or, as yet, suitable grasses to withstand the drought conditions experienced. Where rabbits are a serious pest it is useless attempting sward improvement. It is also difficult to obtain a seed-bed suitable for seedling establishment on land denuded of cover by burning and overstocking. Where a mat-forming vegetation has evolved it does not provide the protection for young seedlings to the same degree as does a good cover of roughage whether it is fescue, browntop, or tussocks.

Time of application is of some importance in the foothill country of Otago. A suitable time for phosphate applications appears to be from the middle to the end of winter and in this respect oversowing with clovers only has been considered. Observations indicate that if seed is sown in winter and reasonable rain and snow fall, the seed can be washed into the roughage cover and will not germinate until spring. Severe frosts are normal on the areas and germination is delayed. The best results have been obtained from May to July sowings, but in years of favourable spring rainfalls sowings in August and even September have been satisfactory. The early sowings, however, give the phosphate time to act and its availability coincides with the germination of the young clover plant in spring. It is necessary to have a good cover of roughage or tussock for protection of the young clover plant when it does germinate and it is significant that on all the areas where success has been secured this cover has been present.

## Costs and Ultimate Maintenance

Although most of the fertiliser has been applied at 1½ to 2cwt. of phosphate per acre, in general where the country is phosphate responsive it appears that the lower rate gives a satisfactory response. Where molybdenum is used the cost of applying 1 to 2oz. per acre would not greatly influence total costs. The cost of application by air depends on several factors, the important items being the distance from the landing field and height that the aeroplane has to fly to discharge its load. As aerial sowing is such a rapid process, it is necessary to employ extra labour to keep the aircraft in operation and with short flight distances it might require 3 or 4 men to keep 2 aircraft in continuous work. Under favourable conditions it is possible to cross sow (one aeroplane sowing at right angles to the other) up to 60 tons per day and a good average is 40 tons. Each aircraft carries 5cwt. per load.

The combined operation of mixing seed and fertiliser into the loader and into the aeroplane hopper and the evenness of spread with 2 aircraft working as mentioned above are quite satisfactory when judged on the results obtained.

The application rates of clover seed have varied from 4 to 8lb. per acre. Several mixtures of white, red, subterranean, and suckling clovers have been used. It is most desirable that good seed should be used, but certain impurities such as suckling clover or timothy in white clover or ribgrass in Montgomery red clover are not detrimental on the class of country concerned. The strain and germination of clover used, however, should be good.

As a general recommendation the basis of the mixtures used for this country should be 2 to 3lb. of white clover and 2 to 3lb. of Montgomery red clover.

Suckling clover can be used either in conjunction with the mixture or as an impurity in the white clover. On the very best of the country where white clover establishes well there is little or no need purposely to include suckling clover. Subterranean clover has no great part to play in most of the areas under review. It may contribute in some areas where autumn and spring rains are good and in the more open or less densely covered slopes.

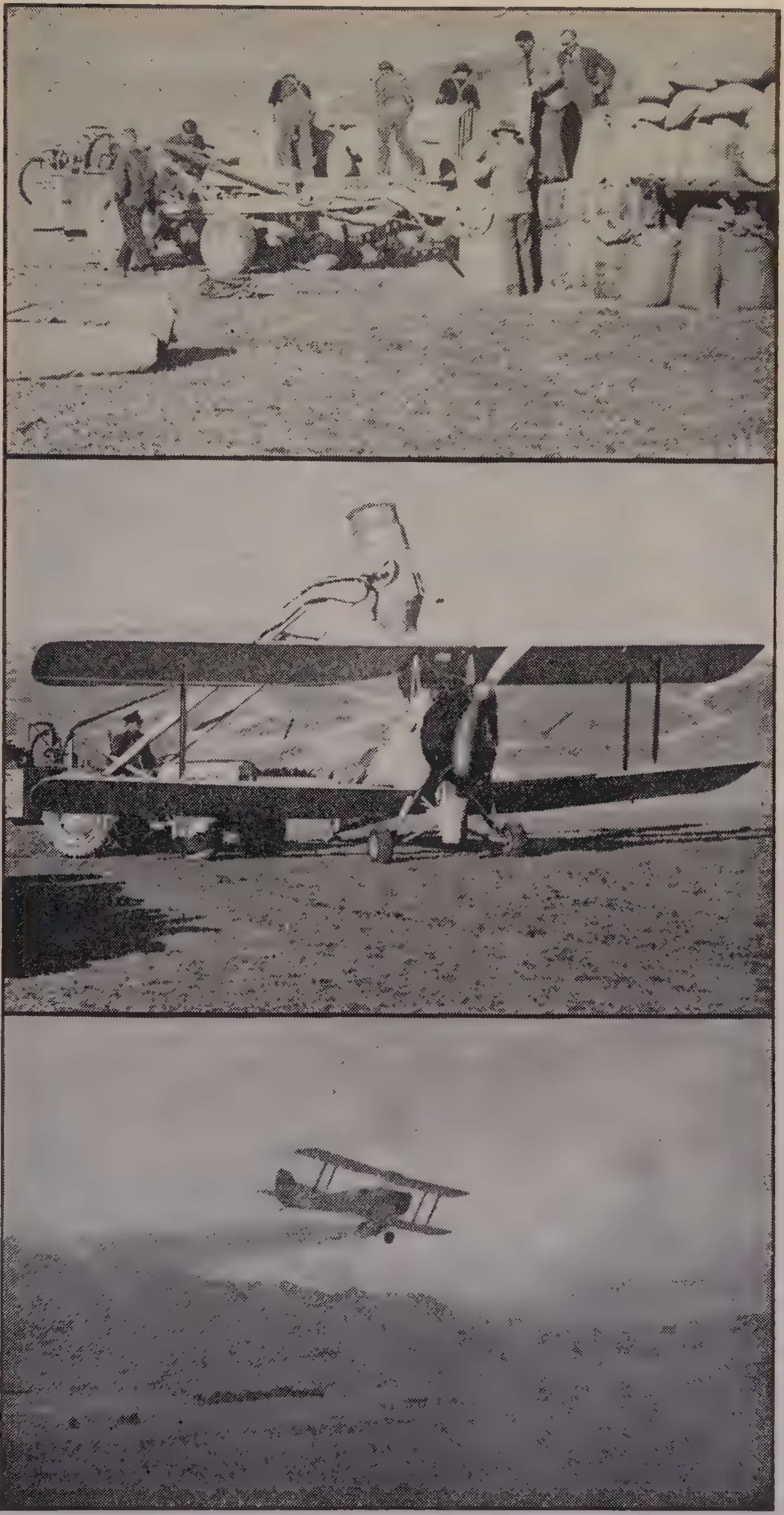
The type of production carried on in the hill-country areas under consideration will limit the effectiveness of the results These areas produce mainly wool and store sheep. Where income is confined mainly to wool, increases in the wool clip alone are unlikely to make the costs economic. However, where tussock blocks are held in conjunction with good pasture-producing lands the increases are likely to be quite favourable. This allows for substantial increases in flock numbers, increased wool weights, and the possibility of the production of some fat stock.

Subdivision is a marked limiting factor to the proper utilisation of the increased growth obtained. Unless the increased herbage production is utilised, there is an unnecessary waste of food. Increased subdivision and a higher degree of management of the flock are necessary on many areas before the full benefits can be obtained.

The cost of maintenance over a period of years of the improved swards produced has yet to be ascertained. In some areas the initial results are so great that the natural tussock sward is being completely replaced. It is not known what will happen to the swards if the initial improvement is not maintained. This type of change has had its parallel in the past on cultivable land where tussock was broken up and sown to grass and where the grass swards were not maintained. It is not uncommon to hear the opinion expressed of these areas that they would have been better left in their natural state.

**It is therefore important to consider at the outset whether once the improvement has started production from and maintenance of the area can be continued. This may entail increased capital charges for subdivision and the periodic topdressing of the areas. The fertility removed from the areas will obviously increase in relation to the increased production obtained.**

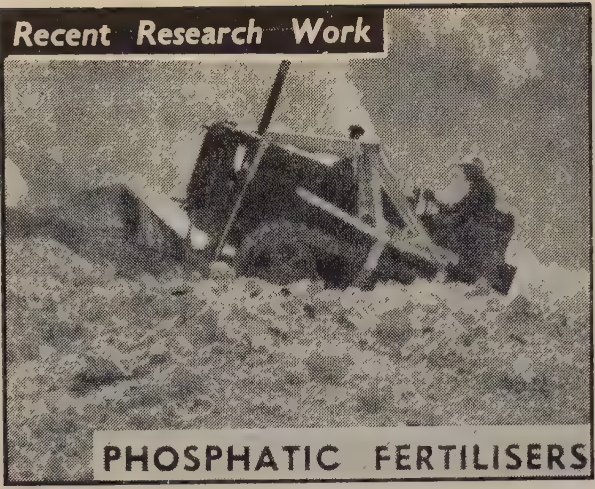
When the various limiting factors have been taken into consideration it appears that on a number of hill-country areas in North Otago there is scope for a certain amount of improvement by oversowing and topdressing. Most of the areas are adjacent to and similar in soil type to already-developed farmlands. In many respects they enjoy a better climate and, being at a higher altitude, benefit from a slightly higher rainfall. After the initial improvement these areas must receive the same attention in maintenance as is given to similar farmland in the adjoining valleys and plains.



[*"Otago Daily Times" photos.*

Operations in aerial topdressing in North Otago. Upper—Filling a loader with fertiliser and seed. Middle—Transferring the seed and fertiliser to the hopper of a light aeroplane. Lower—The aeroplane discharging its 5cwt. load. The Kirkliston Range is in the background.

# Recent Research Work



# PHOSPHATIC FERTILISERS

FOR many years New Zealand has been a large user of phosphatic fertilisers. Most important of these is superphosphate or derivatives of this material such as serpentine superphosphate and "super. compound". To make superphosphate considerable quantities of sulphur are used each year, and if the industry is to develop along the same lines as in the past, still larger quantities will be required. Sulphur is, however, a scarce material and may be still scarcer. To discover something about those fertilisers which can be made without sulphur and to compare their efficiency with the standard materials available in New Zealand, a considerable range of materials was tested at the Department of Agriculture Rukuhia Soil Research Station.

**FERTILISERS** THE fertilisers used, their approximate phosphate contents, and rates of application are shown below:—

| Fertiliser | $P_2O_5$ (Per cent.) | Amount applied per acre (cwt.) |
|---|---|---|
| Superphosphate .. .. .. .. .. | 21 | 3.0 |
| "Thermophos" (a calcium magnesium phosphate from U.S.A.) .. .. .. .. .. | 18 | 3.5 |
| Heskett slag .. .. .. .. .. .. | 16 | 3.9 |
| Double superphosphate (electric-furnace process from U.S.A.) .. .. .. .. | 49 | 1.3 |
| Silico phosphate .. .. .. .. .. | 33 | 1.9 |
| North African phosphate .. .. .. .. | 27 | 2.3 |
| Basic slag .. .. .. .. .. .. .. | 17 | 3.7 |
| Bonedust .. .. .. .. .. .. .. | 22 | 2.9 |
| Metaphos (calcium metaphosphate from U.S.A.) .. .. .. .. .. .. | 63 | 1.0 |
| Serpentine superphosphate .. .. .. .. | 15 | 4.2 |
| "Fused Tricalcium Phosphate" .. .. .. | 27 | 2.3 |
| Makatea rock phosphate .. .. .. | 36 | 1.75 |

The trial, which was conducted over 4 years beginning from 20 March 1947, was carried out on the Hamilton clay loam and was established on an area which during 1944-46 was in vegetables. The area was then sown to pasture after a fallow period.

**SEASONAL EFFECTS** In the first 3 years the seasonal effects showed that superphosphate, being quicker acting than the other fertilisers, was most superior in winter (after the annual autumn topdressing), whereas the other more slowly acting fertilisers showed to advantage in summer. By 1950-51, however, this effect was not so marked, no doubt as a result of a general build-up of the phosphate status in all treated plots. Over the 4 years of the trial the response to superphosphate over control was only 9 per cent., as the area had been well fertilised in the past. However, it was considerably greater than this for several months after the annual topdressings in each year. No doubt differences between the phosphatic fertilisers would have been considerably greater had the level of phosphate response been higher.

**SEASONAL PRODUCTION** The seasonal dry matter produced by the various treatments for the duration of the trial is given in the next column. The yields are given in percentages based on superphosphate, which is assessed at 100.

| | Winter | Spring | Summer | Autumn | 4-yearly total 1947-51 |
|---|---|---|---|---|---|
| Superphosphate .. .. | 100 | 100 | 100 | 100 | 100 |
| "Thermophos" .. .. | 100 | 104 | 113 | 99 | 105 |
| Basic slag .. .. | 98 | 105 | 109 | 97 | 104 |
| Bonedust .. .. .. | 98 | 101 | 106 | 102 | 102 |
| Heskett slag .. .. | 93 | 99 | 107 | 97 | 100 |
| "Metaphos" .. .. | 92 | 100 | 103 | 98 | 99 |
| Double superphosphate .. | 94 | 100 | 102 | 95 | 99 |
| Serpentine superphosphate | 95 | 100 | 104 | 94 | 99 |
| Silico phosphate .. | 93 | 96 | 102 | 102 | 98 |
| "Fused Tricalcium Phosphate" .. .. | 89 | 101 | 104 | 94 | 98 |
| North African phosphate | 88 | 96 | 100 | 98 | 96 |
| Makatea rock phosphate | 91 | 93 | 98 | 87 | 93 |
| Control .. .. .. | 85 | 91 | 94 | 92 | 91 |

In the winters of the first 2 years yields from all treatments are fairly consistently below that from superphosphate. This infers that superphosphate is quicker acting and gives a response sooner after the annual topdressing, which usually takes place just before this period. In 1950, however, "Thermophos", bonedust, and basic slag yielded considerably better than superphosphate. In spring all except Makatea rock phosphate and control fall in the range of 95 to 105 and may be considered equal to superphosphate. Basic slag and "Thermophos" show up to advantage in this period. In summer responses to all treatments except control and Makatea rock phosphate are above that from superphosphate, those from most treatments being consistently so. The autumn shows greater inconsistency than the other periods because of the autumn topdressing occurring during this season. "Thermophos" varies widely over the three autumns. "Fused Tricalcium Phosphate", serpentine superphosphate, Makatea rock phosphate, and control are more than 5 per cent. inferior to superphosphate.

**TOTAL PRODUCTION** Judged on their effect on total production, basic slag and "Thermophos" show up as being the best fertilisers used in this particular trial, yielding significantly higher than superphosphate. Most of the remaining fertilisers gave total yields much in line with superphosphate, although finely ground Makatea rock phosphate yielded significantly less. The low position of North African phosphate is probably due to its not being used in the first year of the trial. In the last year of the trial (1950-51) it yielded almost as well as superphosphate.

It can be concluded from this trial that on the Hamilton clay loam there are a number of fertilisers all of which will yield approximately the same response as superphosphate when used at equivalent rates. Of these basic slag and "Thermophos" have been the best. To recheck this conclusion further trials have been established over a variety of soil types.

—*F. VAN der ELST and J. KARLOVSKY*

* * * *

**CONTROL OF SPURREY** TRIALS were laid down at the Department of Agriculture Invermay Research Station to test the tolerance of rape and swedes to the "grassy" weedkillers T.C.A. and I.P.C. and it was found that these preparations gave good control of spurrey (*Spergula arvensis*), but had no adverse effect on the rape and swede plants. The swede crop had a very heavy infestation of spurrey, which grew up to 10in. high in the control plots. Complete control was obtained with T.C.A. at 20lb. per acre 10 weeks after application. Similar results were obtained with rape where the spurrey infestation was light. In this case T.C.A. at 5lb., 10lb., and 20lb. per acre, and I.P.C. at 1lb., 2lb., and 4lb. per acre, applied as pre-emergence treatments, all gave good control, although T.C.A. appeared to be more effective than I.P.C. T.C.A. and I.P.C. act primarily as rootkillers and to be fully effective they must be washed into the soil and so come in contact with the plant roots. These trials were conducted over a period when the rainfall was below average, and it is possible that these weedkillers may give control in under 10 weeks with average rainfall. It would appear that the pre-emergence treatment will give the best control, and if T.C.A. were sprayed over the soil a month before drilling, spurrey plants could be destroyed before they compete with the rape and swede seedlings. Where spurrey infestation is light, applications of 5lb. per acre of T.C.A. and 1 to 2lb. per acre of I.P.C. may give adequate control. Further work will be done along these lines.

—*J. N. FITZGERALD*

Heading photograph by Sparrow Industrial Pictures Ltd.

# Fruit Growing at Kerikeri

By J. A. CEDERMAN, Horticultural Instructor, Department of Agriculture, Kaikohe

THE fruit growing district of Kerikeri, on the east coast of the North Island some 50 miles north of Whangarei, lies at the head of the Kerikeri Inlet in the centre of the picturesque Bay of Islands. The land is undulating with broad, flat-topped ridges sloping down to tidal inlets, rivers, and small streams, which subdivide the district.

ORIGINALLY part of a sheep run of about 8000 acres known as the Riddell Estate, the more suitable sections were subdivided in 1927 by the North Auckland Land Development Company into blocks of 20 acres for orchard settlement. Of these areas, 5-acre plots were planted as quickly as possible with citrus trees and passion fruit. The remaining 15 acres, some of which were unsuitable for planting in citrus, were left in gorse, bracken fern, or pasture.

From 1927 the district has developed steadily, until today over 600 acres have been planted in commercial orchards. Most of the present orchards are only about 5 acres, owing to further subdivision of many of the original blocks.

## Climate and Soils

The climate, which lies between warm temperate and sub-tropical, favours the production of certain species and varieties of citrus and other sub-tropical fruits. In normal winters only slight frosts are experienced. The topography of the district and the location of streams and tidal inlets influence the severity of these frosts. Winds are normally of low to moderate velocity. Total annual hours of sunshine average about 2120, a total which compares favourably with that of other citrus growing districts.

[*V. C. Browne photo.*

The soils are well drained, friable, mid-brown loams of volcanic origin which are easy to work and when cultivated break down to a fine tilth. The top soil varies in depth from 4 to 18in. and overlies a compact subsoil of dull brown, granular clay.

## History

After the subdivision properties were taken up largely by purchasers from overseas, mainly British residents in China. The North Auckland Land Development Company issued pamphlets setting out schemes whereby properties would be developed and maintained until they reached production, but development costs were often underestimated and returns fell short of expectations.

[*National Publicity Studios photo.*

Kerikeri citrus orchard under permanent pasture.

The residents were all inexperienced fruit growers and looked to the company's "experts" for advice.

Passion fruit was the main crop produced in the first few years. Various companies contracted to take all supplies at prices ranging from 1d. to 2d. per dozen, but nearly all these companies were unable to meet their commitments to growers. Serious fungous and bacterial diseases became rampant in the crops, control measures were difficult, and growers lost interest in passion fruit growing.

### First Citrus Plantings

First citrus plantings comprised chiefly trees imported from New South Wales, the varieties selected being Washington Navel and Valencia oranges, and Lisbon and Eureka lemons. In many instances the growth of these trees was disappointing, because of inadequate soil preparation, lack of shelter, dry seasons, and, in some instances, under-nourishment.

When these trees began to bear the quality of much of the fruit did not come up to expectations. Oranges were thick skinned, of poor juice content and flavour, and tended to dry out when mature. The prices obtained for lemons were poor. Production per tree and per acre was also very disappointing.

The outbreak of citrus canker, a serious bacterial disease, in 1937 temporarily retarded the growth of the industry. Eradication measures included bare poling and in some instances the removal and burning of hundreds of trees.

These setbacks caused growers to search for citrus varieties and other sub-tropical fruits more suited to local conditions. Much better results are now being obtained in tree growth,

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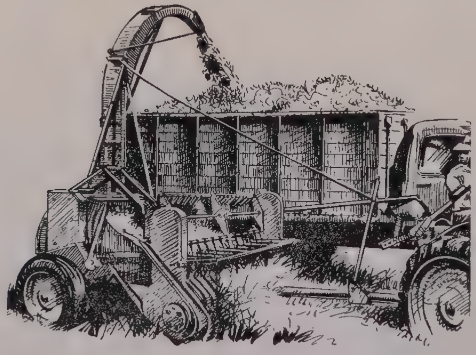

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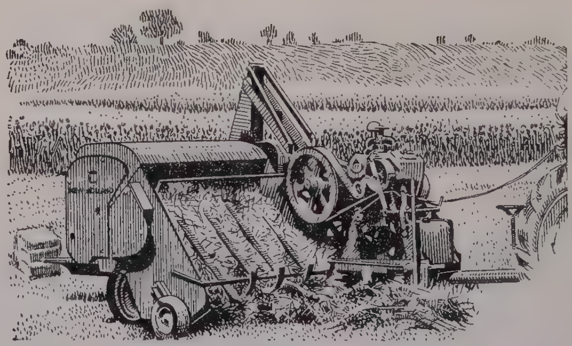

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fruit quality, and yields from the newer plantings of Meyer lemon, Morrison and Wheeny grapefruit, tree tomatoes, and Chinese gooseberries. Also showing commercial promise are several new varieties of sweet orange and mandarin, which are being planted in good numbers.

[*National Publicity Studios photo.*

Citrus nursery at Kerikeri.

## Production of Fruit

Present orchards at Kerikeri are nearly all planted with a mixture of citrus and sub-tropical fruit. The properties are fairly uniform in size, but no two orchards are planted with all of the same varieties or return similar production figures.

With citrus, the rootstock used has a great influence on tree growth, productivity, and fruit quality. Rough lemon or citronelle, the stock used for all the early plantings, has proved quite satisfactory for grapefruit and lemons, but sweet orange and mandarin varieties budded on this stock have been inconsistent in their cropping and fruit quality is unreliable.

The Island sweet orange seedling has now largely replaced citronelle as a rootstock for lemons, grapefruit, and to a less extent sweet oranges. *Poncirus trifoliata* stocks are being widely used for the propagation of most sweet orange and mandarin varieties. Vigorous-growing varieties worked on to this stock normally carry consistent crops of fruit of very good quality. Other rootstocks, including Yuzu and Morton Citrange, which show promise, are being tested in the district.

At present there are 132 registered orchards at Kerikeri. These properties may be classified as follows:—

| | |
|---|---|
| Orchards with no production | 10 |
| Young orchards not bearing | 11 |
| Part bearing .. .. .. | 48 |
| Reasonable production .. | 50 |
| Full bearing .. .. .. | 13 |
| Total .. .. .. .. | 132 |

The orchards listed with no production are neglected; nearly all have absentee owners. Full-bearing orchards are few because there has been extensive interplanting between tree rows and replacement of uneconomic varieties in many older-established groves.

Of the 132 orchards 51 are in first-class condition, 57 are fairly good but could be brought up to a higher standard, 19 are poor, owing to neglect, but could be improved under better management, and 5 are seriously damaged by continued neglect and it would be uneconomic to bring them back into production.

The production figures for the past 5 years (see table below) show a significant crop increase for Meyer lemons, New Zealand grapefruit, tree tomatoes, and Chinese gooseberries. As many of these are not yet in full bearing, further increases over present production are expected. Total gross returns for fruit grown in the Kerikeri district in 1952 were about £91,000.

Production figures shown for sweet oranges and standard lemons are poor and would be classed as uneconomic. The figures of average yields are misleading for the following reasons:—

At least half of the standard lemon trees are in neglected orchards; no worthwhile crop has been harvested from these trees for many years. Trees receiving good attention are yielding from 5 to 6 cases of fruit per year.

The position is somewhat similar with sweet oranges. A considerable number of orange trees have been planted recently and are not yet bearing. A proportion of the older trees are neglected and some of the varieties are unsuited to the district. The rootstock on which many of the older trees are budded has not induced constant cropping. Droughts experienced at intervals have also affected cropping and retarded the natural development of all fruit trees.

### Full Utilisation

Since the average orchard size is only 5 acres, all ground must be fully utilised if the unit is to be economic. To increase production many growers have filled small empty spaces with tree tomatoes and Chinese gooseberries. Tree tomatoes have also been planted along headlands on the sunny side of hakea shelter hedges. In some instances feijoa hedges have been planted along driveways and used as garden shelter.

The method adopted for the replacement of uneconomic citrus trees depends on individual circumstances. Growers with land available usually plant new areas; those with limited space interplant in the rows of the bearing trees. Both methods aim to remove the unsatisfactory varieties when the new plantings come into worthwhile production. Closer planting distances are being adopted with new plantings, sufficient space being left for cultivation and spraying between rows of mature trees, but only sufficient space between trees for pruning and picking.

## Estimated Production of Kerikeri Orchards, 1948 to 1952

CITRUS*

| Fruit | 1948 | 1949 | 1950 | 1951 | 1952 | No. of bearing trees or vines | Av. yield per tree or vine |
|---|---|---|---|---|---|---|---|
| | bus. | bus. | bus. | bus. | bus. | bus. | bus.† |
| Sweet oranges .. | 13,000 | 13,000 | 8,250 | 14,000 | 16,500 | 16,091 | 1 |
| Lemons, Meyer .. | 3,950 | 4,500 | 7,850 | 9,000 | 10,900 | 3,625 | 3 |
| Lemons, standard | 8,250 | 7,500 | 3,800 | 5,450 | 6,000 | 3,400 | 1⅞ |
| N.Z. grapefruit .. | 10,950 | 11,000 | 10,250 | 12,300 | 18,500 | 3,700 | 5 |
| Wheeny grapefruit | 250 | 1,650 | 1,800 | 2,350 | 1,400 | 400 | 3½ |
| Mandarins .. | 50 | 150 | 350 | 400 | 450 | 450 | ⅜ |
| Total citrus .. | 36,450 | 37,800 | 32,300 | 43,500 | 53,750 | 27,666 | |
| SUB-TROPICAL | | | | | | | |
| | tons | tons | tons | tons | tons | | lb.† |
| Tree tomatoes .. | 5 | 36 | 86 | 170 | 225 | 28,000 | 18 |
| Passion fruit .. | 14 | 10 | 12 | 32 | 18 | 6,000 | 6½ |
| Chinese gooseberries .. | — | 2 | 15 | 38 | 48 | 1,800 | 60 |
| Feijoas .. .. | 1cwt. | 1 | 2 | 4 | 5 | 625 | 18 |
| Total sub-tropical | 19.05 | 49 | 115 | 244 | 296 | 36,425 | |

* Production of citrus shown in the equivalent of bushel cases.
† Approximate.

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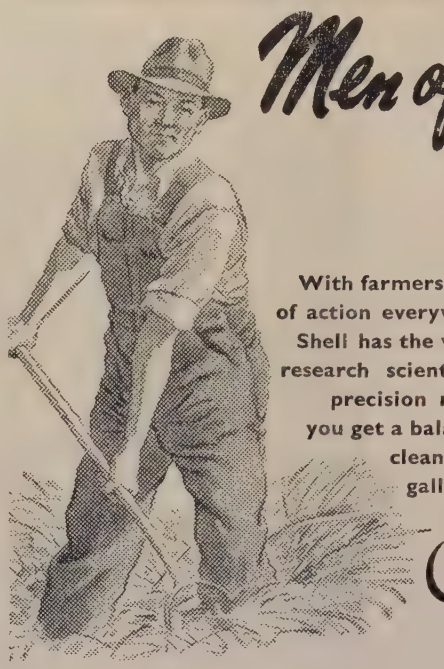

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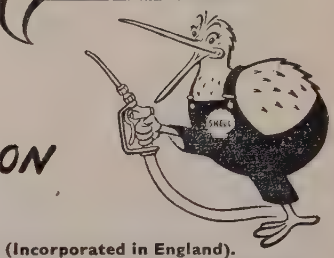

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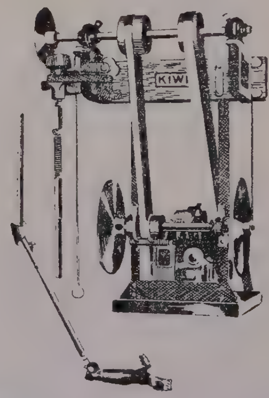

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Planting distances are regulated by the rootstock used and the vigour of individual varieties. Standard distances are: 15ft. x 12ft. for mandarins, 18ft. x 15ft. for oranges and Meyer lemons, and 20ft. x 18ft. for standard lemons and grapefruit.

The high prices received for the sub-tropical fruits such as tree tomatoes and Chinese gooseberries have made it possible for growers with small units to obtain worthwhile returns. It is realised, however, that 5 acres of orchard is fairly small under normal circumstances, but the adoption of closer citrus planting distances and the influence of the production of the other sub-tropical fruits have helped to solve this problem for the present.

## Orchard Maintenance

Orchards at Kerikeri are now exceptionally well subdivided and protected by efficient shelter hedges. Sometimes subdivision by this means has been carried to extremes and has caused some crop loss.

When shelter hedges were first planted growers favoured the use of eucalypts and *Pinus* spp. These species established well, but proved to be unsuitable, except for high back shelter, since both species are serious soil robbers and compete vigorously with the fruiting plants for soil nutrients and moisture.

In recent years *Hakea saligna* has been planted almost exclusively and has proved to be superior to all other types. Hakea usually grows quickly to a height of about 18ft., and if kept well trimmed, can be grown within normal headland distances of fruiting plants without providing undue competition. Effective shelter is obtained with hakea planted along orchard boundaries and as hedges subdividing the orchard into acre or 2-acre blocks.

### Cultivation

Most orchards are planted on sloping ground which has a shallow layer of open topsoil, and this can easily be lost by erosion unless care is taken with cultivation. For this reason, the general practice is to keep the surface cultivated throughout the dry summer only. Frequently an autumn cover crop is sown or the soil is permitted to produce volunteer weed growth, which is turned under in spring.

Some growers have sown their orchards down to permanent pastures, using a grass and clover mixture to maintain a good sward the whole year. The results obtained with sod culture have not been promising. This is probably because of the competition for soil nutrients in spring and for moisture during the dry summer. Pasture and irrigation experiments are now in progress and it is hoped that more information on the possibilities of sod culture will be obtained from this work.

Discs or rotary cultivators are the main cultivating implements used in the area. The purchase of heavy equipment by individual growers is not warranted, because of the smallness of their holdings. The initial preparation

At right—Seasonal work in Kerikeri citrus orchards. Upper—Inter-row cultivation. Middle—Spraying. Lower—Harvesting sweet oranges.

[*National Publicity Studios photos.*

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of new orchard areas and heavy cultivation on established orchards are carried out by contractors.

A deep digger or pan breaker is also extensively used to break the compact subsoil, especially before new blocks are planted. Single cuts are, however, sometimes made down the centre of tree rows in young established groves.

It has been found that root growth is restricted mainly to the zone of topsoil. To encourage deeper penetration some growers dig deep holes before planting and backfill with good topsoil and organic material.

After planting, the area immediately surrounding trees is kept clean by hand digging and hoeing.

[*P. R. Hardcastle photo.*

**Part of Kerikeri settlement, which is 197 miles north of Auckland. At Kerikeri on 3 May 1820 the first agricultural plough, drawn by bullocks, was put into New Zealand soil.**

**Irrigation**

Since the first orchards were planted the health of trees has been constantly threatened by summer droughts. Every mature tree in the district has been damaged at some time through lack of sufficient soil moisture. The dry spells have retarded tree development, upset blossoming and fruiting cycles, and caused serious reductions in crop yields in both the drought years and in the following seasons.

To insure against drought damage many growers have installed some type of irrigation equipment. The amount of water readily obtainable is insufficient for the full irrigation of many orchards, because of the inadequate flow from local bores and the high cost of installing large pipes between rivers and streams and orchard properties.

The standard method for the distribution of water in the orchards is the overhead sprinkler. The amount of water applied per tree and per hour is dictated by the volume of water available and the capacity of the irrigation equipment installed.

Rivers in the district carry sufficient water even in drought periods to irrigate all the orchard areas, but most established orchards are too far from these rivers for direct irrigation. A major irrigation scheme is necessary to meet the requirements of the district. If growers could obtain sufficient water at a reasonable cost to safeguard against drought damage to the trees, one of the major handicaps of the district would be overcome and an increasing measure of stability brought to the fruit growing industry.

**Cover Crops and Mulching**

Blue lupins and oats are favoured as cover crops. Such crops are usually worked into the topsoil by rotary cultivators or cut and used for mulching under the trees. On other orchards the growth is mown, left to dry out, and eventually worked into the soil. Good spring and autumn weather ensures the growth of a considerable bulk of natural weed growth and growers often use this growth as a cover crop.

Supplies of green material are supplemented by material cut from paddocks owned by growers or neighbouring farmers who have surplus feed. Some growers go to considerable expense to obtain mulch material, damaged hay or stack bottoms in the surrounding districts being keenly sought.

Application of mulch around trees and plants helps to increase the humus content of the soil and conserve moisture in dry periods. Tree tomatoes and Chinese gooseberries require a cool, moist root run and appear to benefit greatly from the regular application of mulch material.

The growing of suitable legumes, such as clover and lucerne, as an extra source of nitrogen for the fruit trees has been attempted, but results to date have not been favourable.

**Manuring**

Because of the thin layer of topsoil, heavy applications of manure are needed to build up and maintain fertility. In earlier years many growers placed great importance on the exclusive use of organic materials. Compost was made from all available plant and animal residues and supplemented with suitable organic manure such as blood and bone.

The Kerikeri soils are naturally highly acid and deficient in phosphate, and heavy applications of lime are often necessary to correct this acidity. Applications of phosphatic fertilisers then follow. Growth responses which often follow the application of any quick-acting form of nitrogen indicate that supplies of this element are likely to be low. The addition of potash may also improve fruit quality and texture even though a major deficiency does not exist.

In a soil of this type it is unlikely that optimum nutrient levels can be reached and maintained solely by applying organic matter. The present tendency among growers is to apply regular dressings of a suitably balanced fertiliser mixture. This may be supplemented by special applications of quick-acting nitrogenous fertilisers.

The total quantity of manure applied annually varies with the age of trees and local soil conditions. The standard rate of application is 1lb. of a balanced mixture for each year of the tree's age from planting. Despite present high costs of manures the rate of application is fully justified by profitable increases in production. If manuring is neglected, even for one season, tree growth and health may be seriously affected.

**Pruning**

Pruning of citrus is often neglected and even the importance of pruning young trees to guide formation of the main framework is overlooked by many. Most growers inspect their trees regularly for signs of borer damage, and when the infested branches are being pruned or treated other wood which is dead or diseased is cut away and congested growth thinned out. Many lemon growers make a practice of shortening back fruiting laterals during picking operations.

Where lemon trees have grown very tall, making picking and spraying difficult and costly, the tall centre branches are pruned well back to bring the trees to a satisfactory height. Severe pruning to rejuvenate old, neglected citrus trees has been successful only when coupled with good cultural attention.

The pruning of tree tomato trees is now an accepted district practice. The entire head of old unthrifty trees is removed. Younger trees are pruned back in spring, cuts being made immediately above suitable new growth shoots in the head of the tree. By this method all spent fruiting wood is removed and new growth encouraged. Trees headed back severely produce late crops, which extend the harvesting season. If some are so treated each year, the longer harvesting season should be beneficial in reducing labour costs.

The susceptibility of unpruned passion fruit vines to common diseases such as brown spot and grease spot has shown growers that they must prune their vines heavily if clean crops are to be obtained.

The exceptionally vigorous growth of Chinese gooseberries tends to make their pruning a major seasonal operation. The standard practice is to prune away as much old, spent wood as possible and then to space out new wood shoots, leaving the strongest to carry the next season's fruit. Severe pruning coupled with good cultural practices keeps plants growing strongly and ensures maximum cropping.

**Pest and Disease Control**

The mild climate of the district favours the development and spread of some diseases and pests, though incidence of disease is not unduly high. Most growers depend on contractors using high-powered machines to do their spraying.

This practice, which is adopted because many of the orchards are small and the capital cost of spraying equipment is high, does not always lend itself to efficient disease control. Contractors covering several properties may be delayed by weather and an important spray period may be missed. To reduce costs growers without their own spraying equipment also tend to reduce the number of spray applications below the number necessary for good disease control.

Some orchardists unfortunately are not "spray conscious" and their failure to spray regularly results in the production of a higher percentage of low-grade fruit than is desirable or necessary. Tree health is also adversely affected.

Diseases and pests which are common on citrus in the district are: Citrus verrucosis (*Elsinoe fawcetti*), melanose (*Phomopsis citri*), citrus brown rot (*Phytophthora citrophthora*), bark blotch (*Ascochyta corticola*), wither tip (*Glomerella cingulata*), citrus blast (*Pseudomonas syringae*), sooty mould (*Capnodium citricolum*), black aphis (*Aphis citricidus*), citrus borer (*Aemona hirta*), dicky rice weevil (*Maleuterpes spinipes*), leaf-roller caterpillar (*Tortrix* sp.), red mite (*Paratetranychus citri*), thrips (several species), and scale insects (several species).

Brown spot (*Alternaria passiflorae*) and grease spot (*Phytomonas passiflorae*) are the principal diseases and the passion vine hopper (*Scolypopa australis*) the main pest affecting passion fruit.

Powdery mildew (*Oidium* sp.) and the green vegetable bug (*Nezara viridula*) can be troublesome on tree tomatoes unless controlled.

## Harvesting and Handling Crop

Nearly all orchard plantings include citrus and other sub-tropical fruit varieties with the result that harvesting is spread over all seasons of the year. Harvesting in most orchards is done by the owner, often with the assistance of his family. Some combine with neighbouring growers for harvesting. On the larger orchards casual labour from local sources is employed during rush periods.

The Marketing Department has a depot at Kerikeri which handles all the standard lemon crop. The depot also packs for growers a quantity of other citrus. The balance of the citrus and all the sub-tropical fruit crop is packed and sent to markets direct from orchards. A satisfactory standard is maintained with the grading and packing of most of this fruit, although there is room for improvement in some instances. Care is taken by some growers to maintain very high grading and packing standards; such attention to detail results in higher average prices.

The marketing of the crop with the exception of standard lemons is the growers' responsibility. Fruit from Kerikeri is sent to every market floor in New Zealand and the success of the year's operations is often strongly influenced by the ability of growers to forecast market trends and so to consign their fruit to the best markets. A proportion of the crop is sold direct to private buyers. One of the handicaps which Kerikeri growers have to face is that of distance from their principal markets, which considerably increases the cost of marketing.

## Future of Industry

The general development of the fruit industry at Kerikeri has not been one of easy success. The early growers were chiefly retired people who treated fruit growing as an interesting hobby, whereas the management of a modern orchard is a full-time occupation for a physically fit person. Unsuitable varieties, inadequate attention, and droughts have all caused setbacks from time to time and the industry is only now finding its feet.

Given adequate moisture and fertiliser citrus and sub-tropical fruits grow and crop well in the district. Tree tomatoes, Chinese gooseberries, Meyer lemons, and New Zealand grapefruit have all proved satisfactory. New stocks and varieties of mandarins and sweet oranges may open the door for expansion in these lines.

Quite a large number of orchards have changed hands during recent years and most of the new growers are young people who depend on their orchard returns for their livelihood. They have the incentive and determination to succeed and their advent has given an added fillip to the industry.

There is still land not yet planted which is suitable for growing citrus and sub-tropicals. Any expansion in the industry will depend upon such factors as availability of suitable land, water supply, the use of suitable kinds and varieties of fruit, adequate manuring, and hard work.

To those of the early growers who have remained to make a success of their holdings credit is due for the manner in which they faced up to and overcame the various difficulties and setbacks experienced during the years. The experience thus gained should be of help to the newer growers in their endeavours to become established and to extend a valuable industry.

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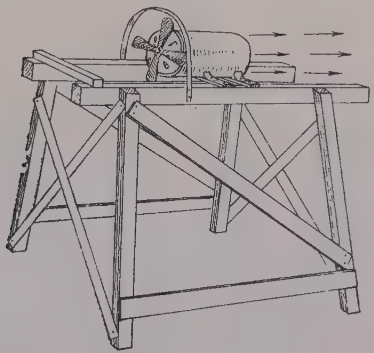
# Aid to Steam Sterilisation of Glasshouses

STEAM sterilisation of glasshouses is always a hot job, especially when it is done in late summer. A fan devised by a Blenheim grower makes the atmosphere more comfortable for operations, first by maintaining a constant circulation of fresh air in the glasshouse and second by blowing escaped steam away from the workmen.

The illustration below shows the general construction of the fan, and details of the apparatus are:—

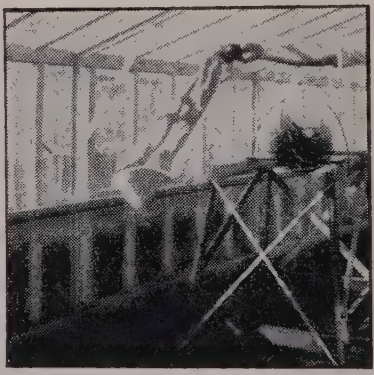
**Fan:** Four blades; diameter of 15in; 3in. pitch on blades.



General construction details of the fan and mounting. The arrows indicate the direction of air flow.

**Motor:** ⅓ h.p.; 1450 r.p.m.

**Framework:** 3ft. 6in. high; bracing timber so arranged that flow of air is unobstructed.



The flow of air from the fan keeps fresh air circulating constantly.

The fan should be 20 to 25ft. from the workmen. If it is closer, too much draught is created, and much of the effect is lost if the fan is too far away. The apparatus has not been tried in a glasshouse where chloropicrin is being used, but it is probable that the fan would be of great benefit in removing any fumes from the vicinity of the operators.

**Acknowledgment**

Acknowledgment is made to Mr. A. M. Le Poidevin, Holdaway Street, Blenheim, for supplying details of this fan.

—*D. W. McCALLUM,*
*Horticultural Instructor,*
*Department of Agriculture,*
*Blenheim*

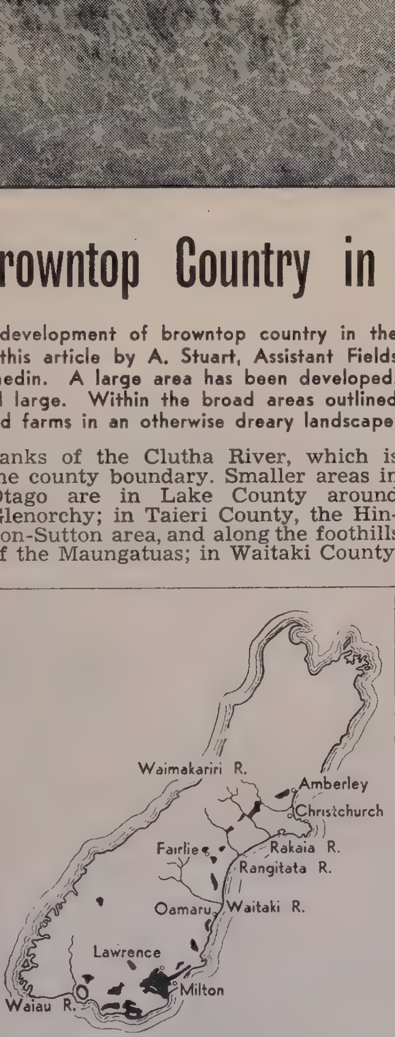
# Development of Browntop Country in the South Island

A SUMMARY of experience gained in the development of browntop country in the South Island in recent years is given in this article by A. Stuart, Assistant Fields Superintendent, Department of Agriculture, Dunedin. A large area has been developed, but the area remaining to be developed is still large. Within the broad areas outlined in the article, however, are many fully developed farms in an otherwise dreary landscape.

IN an agricultural country such as New Zealand there should be no necessity to emphasise the need for development of browntop country. His own economic future may be of the greatest moment to the farmer, but to the average thoughtful producer there occur far weightier national and even international reasons for development. The fact that people in the British Isles are on meagre rations should alone be sufficient to act as a direct impetus to production. When millions of people in other parts of the world are on the verge of starvation, through no lack of effort and organisation on their part, an expansion of the agricultural effort of this country, which is capable of major food production but is not fully developed to achieve it, is obviously called for.

As far as can be predicted prices for primary products should be remunerative, and all producers should be prepared to develop areas reasonably capable of increased production. Most producers will admit that if world prices recede, the farmer who has a fully improved farm is in a far better position than one who is occupying an unimproved farm.

The accompanying map illustrates the main areas of browntop in the South Island. The largest block is in Otago in the adjoining counties of Clutha and Bruce; it lies on both banks of the Clutha River, which is the county boundary. Smaller areas in Otago are in Lake County around Glenorchy; in Taieri County, the Hindon-Sutton area, and along the foothills of the Maungatuas; in Waitaki County, to the north and south of Hampden. The larger blocks in Southland County extend south from Gore on the eastern and southern foothills of the Hokonuis, and also south from Wyndham to Otara and Waikawa. In addition there are scattered areas on the Waimea and Five Rivers Plains. In Wallace County the main areas are situated on rolling country around Nightcaps and Eastern Bush, and an area circles the foothills of the Longwood Range and extends up to the bush line. In Canterbury browntop extends from Amberley to Waimate, clothing the foothills of the Southern Alps and to some extent the rolling downs country below the foothills.



The shaded areas on the map indicate the main areas of browntop in the South Island suitable for conversion into high-producing, dominantly ryegrass and white clover pastures.

It has been estimated that the area in Canterbury is 600,000 acres and that a similar area is in Otago. In Southland, after allowance is made for areas already improved, not more than 400,000 acres needs development. Those conversant with these areas will be the first to admit that the scope for development is greater here than it is on the more fertile and already improved coastal areas, as the land detailed in the preceding paragraph is capable of improvement from third-class country to highly productive fat-lamb country, more than two-thirds of the area being ploughable.

## Soils

The soils in Canterbury and Otago on which browntop is dominant have been classed in the main by the Soil Bureau as zonal soils of yellow grey earths, whereas those in Southland have been classed as yellow brown

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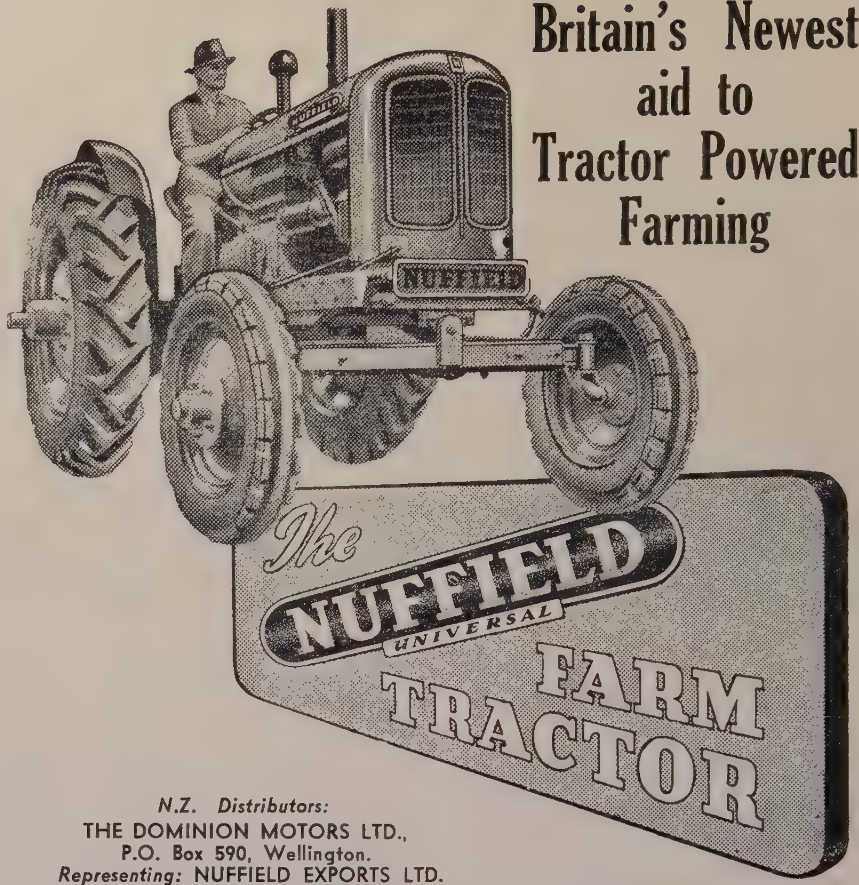

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Left—Sodbound browntop country reverting to rushes. Such land is capable of growing pastures of the quality shown at right, which are dominantly ryegrass and white clover and have a carrying capacity of 5 or more ewes to the acre.

earths, moderately or strongly leached as a result of the heavier rainfall. On most soils in South Otago and Southland the topsoil is 6 to 7in. deep, but in Canterbury the average depth is only 4 to 5in.

In South Otago a typical soil profile shows 6in. of grey silt loam, 10in. of mottled grey and yellowish brown loam, 2in. of gravelly "ironstone" concretions, and 8in. of brownish yellow silty clay loam, all underlaid by yellowish silt loam. The compacted "ironstone" concretions at a depth of 16in. are liable to cause waterlogging in a wet season, but fortunately the subsoil permits mole drainage.

Most of the soils of the browntop-dominant areas have a high lime requirement, varying from 2 to 4 tons per acre and increasing from northern to southern districts.

## Browntop Turf

In the unimproved state the sward may consist of a dense mat of sodbound browntop. Where the ground has been previously cultivated there are usually traces of other grass species such as crested dogstail, Yorkshire fog, and on areas of slightly higher fertility possibly traces of perennial ryegrass and in some cases even traces of white clover, alsike, and suckling clover. Generally, however, the establishment of clovers is negligible, as the acid soil conditions do not permit their survival.

## Methods of Cultivation

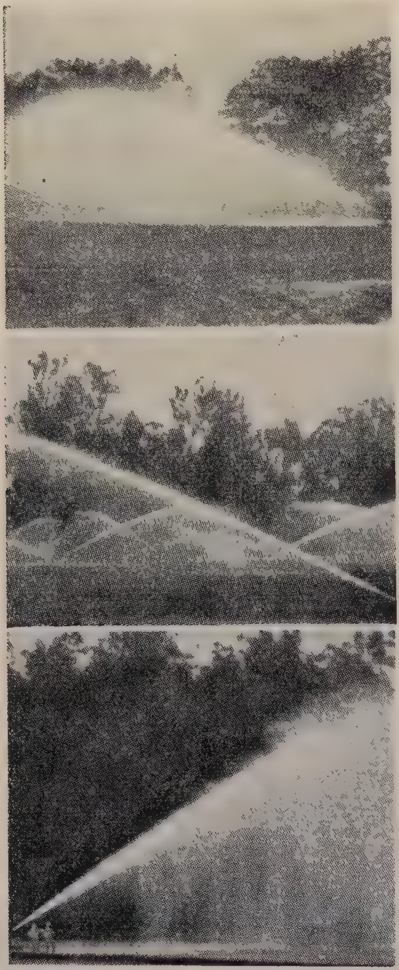
There are two schools of thought regarding the correct method of killing browntop roots. A critical examination of both methods indicates that the variation between them apparently is caused by the rainfall and depth of topsoil available in different areas. In southern districts the extra depth of topsoil permits the use of the swamp plough in late summer or early autumn, and by this a wide furrow is turned over flat to a depth of 7 to 8in. An inch of subsoil exposed to the air in this way is no deterrent to the growth of the swede crop sown the following spring. In these districts, owing to the high and well-distributed rainfall, it is useless to rely on surface cultivation to destroy the browntop.

In the initial stages of development in Canterbury it was considered good practice to skim plough early in winter and later deep plough, but, because of the unreliable weather on the foothills and the advent of the track-laying tractor, use of the digger plough is now recommended. This method has proved most economical and satisfactory, as it leaves the soil broken throughout winter and saves additional cultivation in spring. If a digger plough is not available, the land should first be hustled with a stiff-tined cultivator and then deep ploughed with a mouldboard plough to a depth of 6 to 7in. These are substantially the same methods as in Southland, except that the swamp plough is used only on rare occasions.

Though the Canterbury method is advantageous in incorporating the decayed browntop turf throughout the topsoil, and thus avoids depositing this turf in a layer between topsoil and subsoil, the heavier rainfall in southern districts would make a kill almost impossible even in summer. For southern districts the swamp plough is still advocated. These districts also derive greater benefit from the heavier swede crops grown, as these are consumed in the field and fertility is thus built up. The turf layer does not hinder the development of the swede crop, as the normal rainfall is sufficient to supply the crop's moisture requirements without dependence on capillary water from the subsoil. Generally, after the feeding off of the swede crop the land is not ploughed for the second crop, discing, harrowing, and rolling being sufficient to secure a seed-bed for this crop. This supports the axiom that where there are apparently opposing theories in farming practice the local district practice is the one to follow, for it has been tested over a long period by successive generations, and unless it had had good results almost invariably it would not have been continued.

## Liming

As already indicated all browntop soils have a high lime requirement, varying from 2 tons per acre of carbonate of lime in Canterbury to 4 tons per acre in southern districts. Experience has shown that most of this lime should be applied while the ground is "black" to secure maximum results in a short period. In Canterbury if only one application of lime is to be made, this is delayed until immediately before the grass mixture is sown, but farmers in a position to do so prefer to apply 1 ton of carbonate of lime per acre some 2 months before the root crop is sown, and the second ton before final preparation of the seed-bed for grass. In this way the resulting pasture secures the maximum benefit from the lime applied. In southern districts the first 2 tons per acre are almost invariably applied before the first crop of swedes, and the second application, which will vary from 1 to 2 tons per acre, is given immediately before the grass-seed mixture is sown.



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Though applications of lime to existing browntop pastures, provided some white clover is present in the sward, may result in improvement, this method is not advocated on ploughable country, as the initial results are slow and the final result falls far short of that obtained after ploughing.

## Drainage

To obtain the most successful results in both crops and subsequent pasture, drainage must be adequate. A compacted layer of ironstone nodules at varying depths in the subsoil impedes drainage, but in most areas the subsoil is amenable to mole drainage, and some of these drains have been reported to be working after 20 years. On the rolling country good use can be made of gullies for outlets, but on flatter country a series of tile drains with the mole drains is generally necessary. Open drains have been used to a limited extent on the areas of swampy, low-lying country, but generally, if the fall permits, these are rapidly replaced by tile drains, owing to stock losses, particularly at lambing time. Most existing open drains are graded back on one side so that stock may have a chance to regain firm ground.

Swedes are invaluable as winter feed for ewes. Break feeding should be adopted.

## Initial Crops

In southern districts, if the furrow slices do not lie flat after swamp ploughing, the land may be rolled on the furrow to prevent browntop growing along the furrow slices. This is often done as a precautionary measure. Generally the first crop is swedes, to be ridged in November. After a preliminary discing in September the first 2 tons of carbonate of lime are applied at that time. Immediately before ridging the final cultivation is given, consisting of 2 or 3 double discings, each followed by harrowing. The land may be rolled after each harrowing, but before ridging this practice is essential. Sometimes a clodcrusher may be substituted for the roller. When the crop is ridged 3cwt. per acre of reverted superphosphate is applied through the ridger at the time of sowing.

After the swede crop is fed off in breaks during winter the ridges are disced down as the breaks are used. In the following spring ploughing is usually avoided, as the land is free of troublesome weeds, and 2 or 3 double discings, followed by harrowing and rolling, are usually sufficient to secure a good seed-bed for grass. Where large areas of browntop for development remain it is not usual to follow with a second crop before sowing grass. Before the final harrowing it is usual to apply the further necessary 1 to 2 tons per acre of carbonate of lime, depending on the soil's lime requirement. The grass mixture is usually sown broadcast and 2cwt. of "super. compound" are applied at sowing; the area is finally lightly harrowed and rolled.

If a nurse crop is grown, oats or lamb feed may be used. Fertiliser is then drilled with the crop and the ground is harrowed and rolled before the grass is sown in the ordinary way. It is preferable to sow rape as the nurse crop, as the feed consumed is returned to the paddock through the grazing animal; generally bought-in store lambs are fattened. If the areas are large, it is usual to sell the grazing of portion of the swede crop not required by the farmer's own stock, and in recent years remunerative prices have been received for wintering of stock in this way.

In Canterbury, as well as the difference from southern districts in the initial cultivation, generally two crops are taken before the grass-seed mixture is sown. Local practice also differs in that autumn sowings of grass are favoured rather than the spring sowings in southern districts.

Linen flax has been favoured for initial crops in those districts in which there is a flax factory. This crop provided a remunerative return, did not exhaust fertility, and was harvested early. Linseed is favoured to some extent, and barley and oats have been used as cash crops. After the cash crop it is usual to sow a winter feed crop such as turnips, swedes, or chou moellier. Sometimes a fattening crop such as rape is grown as a second crop. The winter feed crop is more successful when grown as the second crop than when grown as the initial one. The feed crop when consumed in the field raises the surface fertility, and after a short fallow the land is consolidated and finally prepared for the sowing of grass in the following January or February.

Carbonate of lime may be applied at the rate of 1 ton per acre immediately before the drilling of the feed crop or, though this is not usual, it may be applied before the sowing of the cash crop. A second ton is applied immediately before the grass sowing.

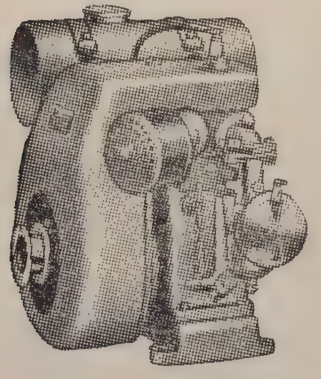
Throughout the South Island once the initial requirement of lime has been satisfied it is standard practice to apply to the renewed pastures 5cwt. of carbonate of lime annually. Alternatively this may be applied at 10cwt. per acre every second year, normally in autumn; it acts as a maintenance ration, satisfying losses due to leaching in drainage water.

## Resulting Pastures

Depending on the original state of the browntop sward and the build-up of fertility supplied through the feed crops grown, the soil may not reach the highest standard for resowing grass at the initial development, but in southern districts after a heavy swede crop, and particularly with in addition a nurse crop or rape, it has been found that the resulting pasture is persistent. Generally, however, the pasture produced at the initial attempt will last until the land is again needed in the rotation.

As with all grass-seed mixtures the use of Certified seed is essential for obtaining persistence, vigour, and productivity of the sward. A satisfactory mixture consists of 20lb. of perennial ryegrass, 10lb. of short-rotation ryegrass, 6lb. of cocksfoot, 3lb. of white clover, and 2lb. of Montgomery red clover, a total of 41lb. per acre. For the higher-rainfall districts and particularly where set stocking is practised the cocksfoot may be replaced by 5lb. of timothy. Some farmers include both species, but on a reduced scale. Where cocksfoot is included 1 or 2lb. of crested dogstail could also be sown, as this grass is invaluable in early spring, and because of its free-seeding habit establishes freely on any bare ground, preventing the ingress of inferior weed grasses that would otherwise occupy these spaces. In Canterbury the use of crested dogstail is recommended for all mixtures.

The ryegrass-white clover-dominant pastures thus produced are able to carry four to five times the number of sheep previously carried, and where a large percentage of dry sheep was carried the farmer is now able to have ewes. Consequently the revenue is increased by the sale of the lambs produced and the extra wool clipped. The change from dry-stock to wet-stock farming is most noted in southern districts, where the number of fat lambs killed has trebled and even



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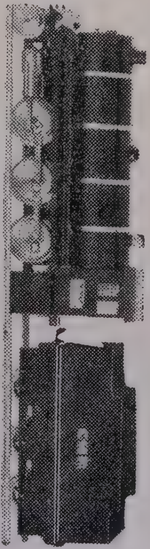

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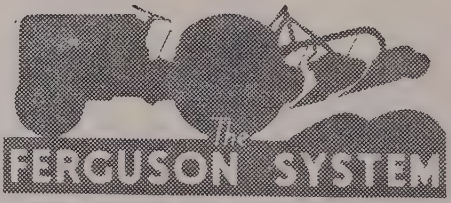

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After the swedes have been fed off, the land should be double-disced two or three times, harrowed, and rolled, preparatory to being sown in a pasture mixture.

quadrupled over 20 years, largely owing to the improvement of this class of country.

## Subsequent Management

Once a good pasture has been established it is necessary to topdress it annually with 2cwt. per acre of "super. compound" in addition to the maintenance ration of lime already mentioned. This may appear somewhat heavy to Canterbury farmers, although a number do apply this quantity in two dressings, one in spring and one in autumn. However, in enabling 4 or 5 ewes and their progeny to be carried during the growing season this practice will pay dividends, and the extra dung and urine from the high stock concentration will keep the fertility at a level at which there is no danger of the grasses and clovers running out, as would happen under a lower standard of management.

As this class of country is usually developed in large blocks, a plan for subdivisional fencing is necessary in the early stages of development. Associated with this plan there should be provision for shelter belts, which calls for double fences, unless suitable gullies and unploughable corners can be used. Under rotational grazing or even set stocking paddocks require to be of a size that will assist in the control of grazing at all periods of lush growth. By this management it is easy to drop a paddock from the rotation and use the growth for silage or hay, or, as with set stocking, to spread the stock from one paddock on to the others being grazed, thus achieving the same result.

Quite a number of farmers are finding that cattle assist materially in the control of spring pasture growth, and that as a consequence ewes and lambs thrive much better. During winter the cattle may be carried on the rough grazing on the unploughable parts of the farm, and generally hay is available with the roots grown for winter feed.

## Successful Results

The following results on several properties are quoted as being typical of those obtained by the average progressive farmer, and on most properties the capital necessary for development has been obtained from farm revenue. Where the necessary capital was available in the early stages the development has been more rapid, and examples of this can also be quoted.

Farmer A at Wairio took over a property of 436 acres in 1924. The whole area was in browntop and carried only 200 sheep. Drainage was the first necessity. In early autumn the land was swamp ploughed to a depth of 10in. After a preliminary working it was limed at the rate of 1 ton of carbonate of lime per acre. The rotation followed was swedes, oats, and rape and grass or turnips and grass. Surplus swedes were sold for grazing, and the oat crop for cash after the needs of the farm had been met. Often a perennial ryegrass seed crop was saved from the maiden pasture in summer after the feeding off of the nurse crop. Today this farm carries 1200 ewes, 400 dry sheep, and 40 cattle. Only 20 acres are broken up each year, being sown to swedes, which provide sufficient winter feed with 1500 bales of hay saved for that purpose. In recent years the pastures have been topdressed annually with 5cwt. per acre of carbonate of lime and 1¾cwt. of serpentine superphosphate.

Farmer B at Waimumu, who previously owned 400 acres, acquired a second block of 400 acres of easy rolling browntop-dominant country 17 years ago. At that time it carried less than one sheep per acre. Drainage was the first requirement, followed by swamp ploughing in early autumn. The land was worked early in spring and 2½ tons of carbonate of lime per acre were applied. Swedes were ridged in November. The following spring, after the swedes were eaten off, the land was worked up and a further ton of lime applied before ridging of rape, to be used for lamb fattening. Immediately before grass was sown in the following spring another ton of carbonate of lime was applied. Today the block of land is carrying more than 3 ewes per acre in addition to the cattle necessary for pasture control. The normal topdressing programme is 1¾cwt. of "super. compound" and 5cwt. of carbonate of lime per acre annually.

Farmer C at Te Tipua acquired a typical browntop farm of 383 acres 30 years ago. At that time 300 sheep were carried. At the beginning blocks 50 acres in extent were broken in. The land was ploughed in early autumn to a depth of 6in. and left to mellow over winter. One ton of carbonate of lime was applied in spring and the land ridged to Aberdeen turnips or swedes. In the following spring the land was sown out to grass with oats or rape as a nurse crop. No further lime was applied at that stage owing to transport difficulties and lack of capital. It was not until 1930 that the topdressing of the sown pastures with 1¾cwt. of phosphate and 10cwt. of carbonate of lime per acre became a regular management feature every second year.

Today the farm is carrying 800 ewes, 500 dry sheep, and 70 cattle. The cropping programme comprises 40 acres of swedes, followed by rape and grass. Two tons of carbonate of lime per acre are now applied before the swede crop is ridged and a similar quantity before the grass is sown. Winter feed is also obtained from 3000 bales of hay saved annually, the average yield being 150 bales per acre. This example illustrates the delayed progress brought about by lack of capital for speedy development in the early stages, when motor transport and bulk handling of lime were still dreams to the average farmer.

Farmer D purchased a property of 780 acres at Clydevale in February 1946. Until then all the revenue obtained from the block had been that derived from browntop seed production. By March 1952, through the development of large blocks each year, the ploughable area had been developed and the number of sheep carried had increased gradually to 1100

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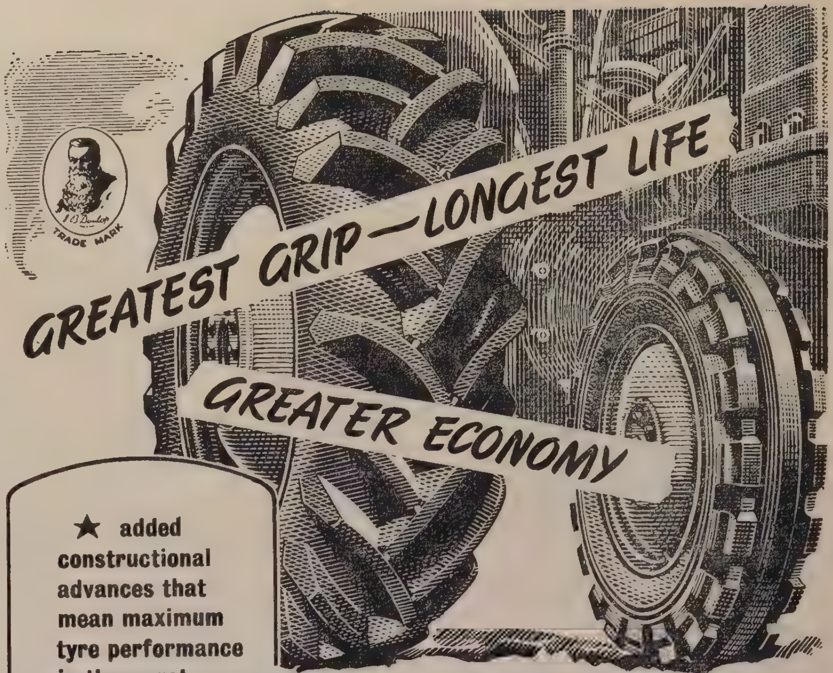

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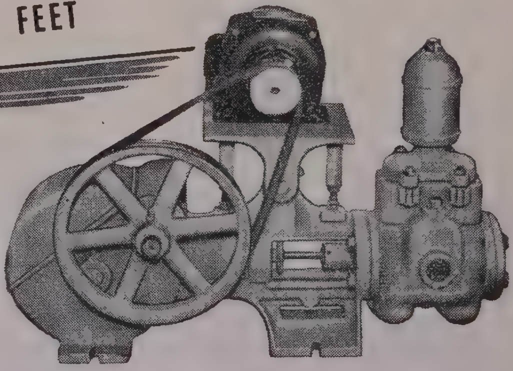

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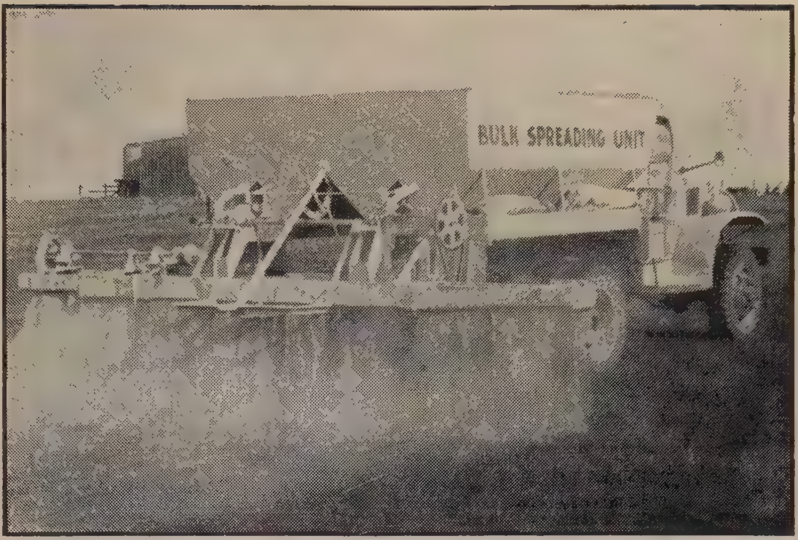
ewes and 350 hoggets. This example illustrates how quickly progress can be made if capital and labour are available for development. When the last block of 170 acres, now in swedes, is sown out to grass it is estimated that the winter carrying capacity will increase to approximately 2½ sheep to the acre. This figure will again be increased when the pastures are dealt with for the second time in the cropping rotation, which will consist of swedes, wheat and/or oats, and rape and grass.

Farmer E at Waiwera South purchased a farm of 428 acres in 1946. It had been farmed as a remote block some distance from the main homestead of the previous owner. The pastures were browntop dominant and the stock carried were 400 ewes. The feed was considered barely sufficient for that number. The boundary fences were in poor condition and gorse and broom were encroaching from the road lines. Internal fencing was almost non-existent. For the first 2 years much time was devoted to fencing and the control of weeds. Today 70 acres are in first-class pasture, and 40 acres are grass sown last spring with rape as a nurse crop. On the established grass 1¾cwt. of "super. compound" and 5cwt. of carbonate of lime are applied annually.

Last season a total of 400 tons of carbonate of lime was purchased and some of this was applied to the better-class browntop pastures yet to be developed. Considerable improvement of these pastures has been demonstrated and the farmer considers the expense warranted. Today the farm carries 680 ewes and 160 ewe hoggets. In addition 200 store lambs were purchased and fattened on the surplus rape. The rotation has been old pasture, then rape and grass, with a small area of oats and grass. This is an example of steady improvement by a farmer who has had little capital apart from revenue, some of which, however, has been derived from an acre of potatoes grown each year on a creek bank which runs through the property.

Farmer F purchased a farm of 750 acres at Te Houka in 1946. The property was then carrying 500 ewes, 100 ewe hoggets, and 7 cattle. The pastures were browntop dominant and in poor condition. By adopting the methods advocated in this article this farmer is now able to carry 1200 ewes, 300 ewe hoggets, and 100 wethers. Approximately 25 per cent. of the lambs are fattened off the mother and the remainder, with the exception of the ewe hogget replacements, are fattened on feed. The rotation followed has been old pasture to swedes, to a cash crop of linseed, wheat, oats, and/or barley for seed, to rape and grass. The quantity of lime applied is 20 to 30cwt. per acre before ridging the swedes, 1 ton before drilling the cash crop, and a further ton before sowing the rape and grass.

Farmer G purchased a farm of 481 acres at Geraldine in 1938. Of this farm 250 acres had a stiff clay soil, the remainder being a freer stony soil. The whole farm was browntop dominant and carried one ewe to the acre, and the wool clip averaged between 5 and 6lb. per ewe. The procedure followed was to plough to a depth of 5in. in winter, spring cultivate with discs and harrows, and ridge swedes for the first crop. After the swedes were fed off the land was either ploughed to a depth of 3in. or worked with the discs alone for a crop of rape and grass. Carbonate of lime was applied at the rate of 1 ton per acre before the swedes were ridged, and again before the rape was sown. Today the carrying capacity is 950 ewes, 300 hoggets, and 30 cattle. The lambing average is now 125 per cent., and a quarter of the lambs are fattened off the mothers, the remainder being fattened on rape and grass. The ewes now average between 10 and 11lb. of wool. All the pasture is topdressed yearly with 1½cwt. of "super. compound". The cropping rotation today is 30 acres of swedes, followed by rape, wheat, and grass. Some 2000 tons of carbonate of lime have been applied during the past 14 years, representing over 4 tons per acre. For the past 6 years an area of 8 acres of lucerne has been cut for hay.



Maintenance topdressings of lime, usually applied at 5cwt. per acre a year, are recommended for improved pastures in browntop areas.

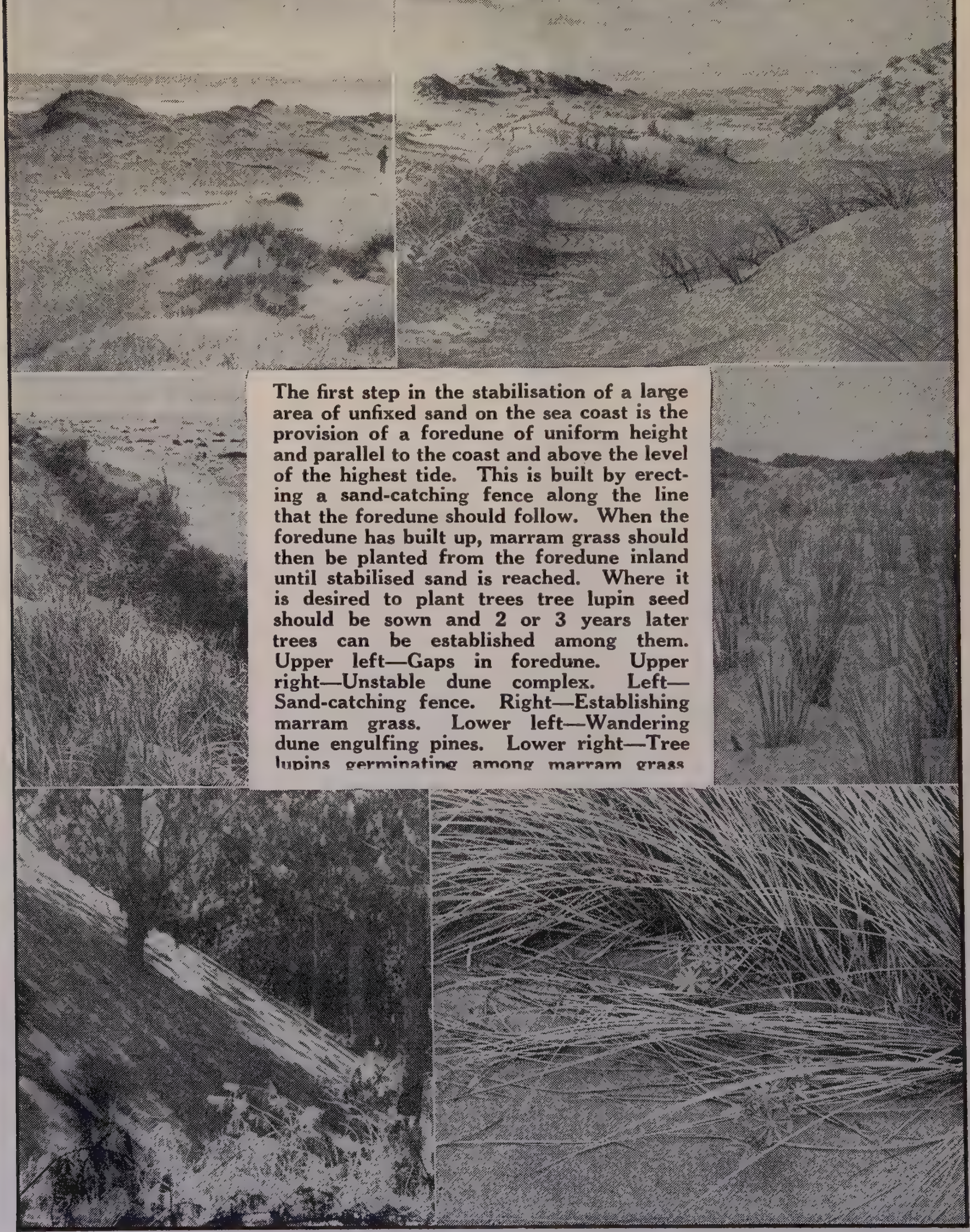
Farmer H at Maungati in 1944 purchased a farm of 450 acres, some 150 acres of which were unploughable. All the pasture was dominant browntop, and the stock carried was 600 ewes and 150 hoggets. Fences were generally poor. The procedure for breaking in was to plough during May and June to a depth of 5in. Before turnips and Italian ryegrass were sown, the area was hustled to the bottom of the furrow and then top worked. The following November the land was again ploughed and worked for turnips and grass. One ton of carbonate of lime was applied immediately before the first crop was sown, and a similar quantity before the second crop was sown with the grass. In addition some paddocks have received a further topdressing of ½ ton of carbonate of lime per acre. The carrying capacity is now 1125 ewes, 450 hoggets, and 60 cattle. All pastures receive 1cwt. of "super. compound" annually. Wool weights have increased from 7 to 11lb. per head over the period. No rape is grown for lamb fattening, as store lambs are now fattened on grass.

Farmer I purchased at Wairio, near Nightcaps, a farm of 277 acres, of which 40 acres remains in bush and scrub yet to be developed. The previous owner was in occupation for 20 years, and during that time a horse team was the motive power and oats, roots, and rape featured in the rotation. The carrying capacity was 200 ewes, and most of the lambs were sold as stores. Virtually no progress was made until lime was first applied in 1942. The present owner's policy has been to plough each winter 20 acres to a depth of 4 to 5in. with a long mouldboard plough. He is a firm believer in ploughing as shallow as is possible with getting a good kill of browntop. In spring the ground is worked with discs and harrows and ridged to swedes. After the crop has been fed off the land is not ploughed but merely disced, and after a summer fallow is sown to grass, occasionally with a nurse crop of a bushel of oats per acre.

One ton of carbonate of lime is applied before the grass is sown and a further ton as a topdressing 12 months later; 1½cwt. per acre of "super. compound" is applied with the grass seed, and the topdressing programme is 1½cwt. per acre of "super. compound" and 10cwt. of carbonate of lime every second year. No rape is grown, as all lambs except replacements are sold mainly as good forward stores immediately after weaning. The present carrying capacity is 600 ewes, 230 hoggets, 20 dry sheep, and 20 cattle. The lambing percentage is 125, and the wool weight averages 10½lb. per head. The present owner's success, compared with the last owner's failure, can be attributed mainly to lime.

From a perusal of the results obtained by these farmers there can be no doubting the soundness of the programme advocated for the development of browntop country in general. In all cases increased production has rapidly followed development.

# STABILISATION OF A DUNE COMPLEX AREA



The first step in the stabilisation of a large area of unfixed sand on the sea coast is the provision of a foredune of uniform height and parallel to the coast and above the level of the highest tide. This is built by erecting a sand-catching fence along the line that the foredune should follow. When the foredune has built up, marram grass should then be planted from the foredune inland until stabilised sand is reached. Where it is desired to plant trees tree lupin seed should be sown and 2 or 3 years later trees can be established among them. Upper left—Gaps in foredune. Upper right—Unstable dune complex. Left—Sand-catching fence. Right—Establishing marram grass. Lower left—Wandering dune engulfing pines. Lower right—Tree lupins germinating among marram grass

HEADING PHOTOGRAPH: A sand ridge which has been stabilised by planting with marram grass. If the paddock is heavily stocked, the ridge will need to be fenced off.

# Stabilising Sand Country at Flock House Farm of Instruction

THE beach frontage at Flock House Farm of Instruction near Bulls in Rangitikei County extends for more than 3 miles, and, running roughly parallel to the beach, a large plantation of *Pinus radiata* covers in all about 900 acres. The seaward margin of this plantation is very irregular; at the closest point it is about ½ mile from the beach and at the farthest point is more than a mile. Between the beach and the plantation is unconsolidated sand country estimated at more than 1300 acres. In this second of a series of articles on Flock House and land development there D. I. Glue, Instructor in Agriculture, Department of Agriculture, Wellington, discusses work in stabilising sand country on the property.

THE topography of the area is a complex mosaic of high, arid sandhills and low-lying wetter areas of sand plain. Such an area is called a dune complex. The vegetation, which consists mainly of scattered plants of spinifex or silvery sand grass (*Spinifex hirsutus*), pingao (*Desmoschoenus spiralis*), *Scirpus nodosus*, and *Carex pumila*, is too sparse to stabilise the area, and in summer much sand blowing occurs. The cutting, abrading, and smothering powers of such wind-borne sand are so great that only the hardiest or best-adapted plants can survive. In one relatively sheltered area there is an old-established stand of tree lupin (*Lupinus arboreus*) which is tough enough to endure the cutting action of the wind-driven sand, but it is noticeable that though every year many hundreds of seedlings germinate from the seed shed by this stand, not one of them survives the summer.

Of immediate concern is the fact that many of the dunes, being insufficiently stabilised by vegetation, have begun to wander and are moving slowly but remorselessly inland. Already many trees at the seaward edge of the plantation have been smothered by huge barriers of moving sand. In one place a few feet only of the tops of dead pine trees 40ft. high can be seen protruding from the crest of a wandering dune.

The stabilisation of an area such as this may be considered in three parts, as follows:—

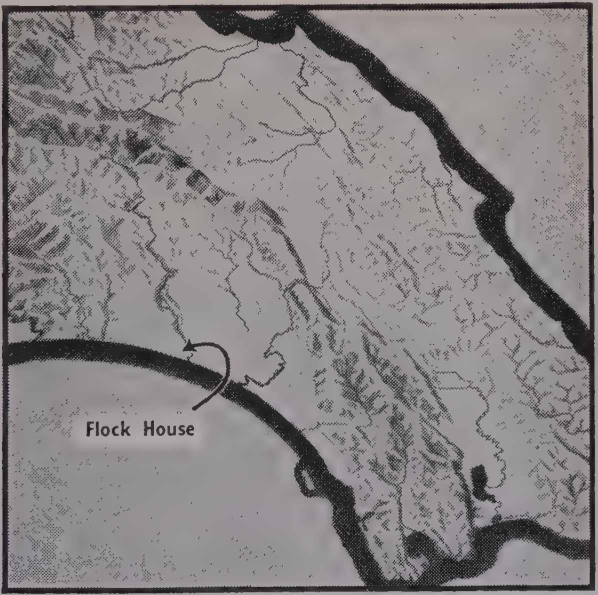
The erection of a sand-catching fence and the establishment of a stable foredune.

The establishment of a cover of marram grass (*Ammophila arenaria*) from the foredune to the plantation edge.

The establishment of tree lupins, and then pines, in selected areas.

## Sand-catching Fence and Foredune

The first step in the stabilisation of this area is the provision of a continuous foredune 20 to 30ft. high parallel to the beach and at least 30 to 40yds. above high-tide level. This is achieved by the erection of a sand-catching fence along the line of the proposed foredune. This consists of a row of posts, about 5 to 6ft. high at ¼-chain intervals, to which are attached four wires. Two are attached on the seaward side of the posts at heights of 1ft. and 4ft. and the other two are attached at the same heights, but on the landward side of the posts. Between these wires manuka scrub is laced to form an efficient sand-catching barrier. The object is not to build a fence that is an impenetrable windbreak, but to provide an obstacle which slows down the wind and causes it to drop most of its load of sand behind the fence. The sand builds up at the fenceline, raising the level of the foredune and at the same time burying the fence. As the fence becomes covered a further fence is erected above it and the process of sand accretion continues until a level-topped, continuous foredune is built.



[*From a map prepared by the Education Department.*

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The sand-catching fence is easy and economical to build. Old wire is used, all the posts are obtained from the beach nearby, and the manuka scrub is obtained from an area on the farm now being cleared.

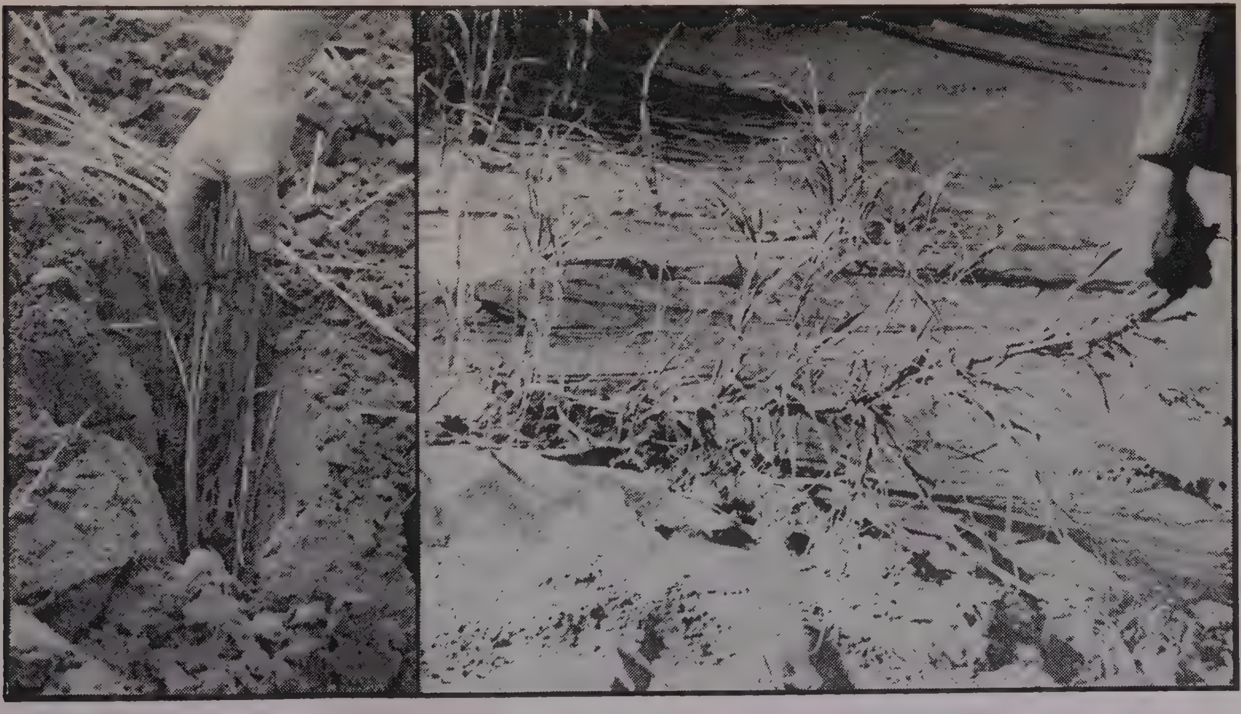
The foredune must be stabilised by vegetation, and two grasses are of value for this purpose. Silvery sand grass, or spinifex, is used to stabilise the "toe" of the foredune—the part nearest the sea—where the rate of sand accretion is often very great. With its long, trailing underground stems spinifex can grow and thrive even when being constantly buried under masses of raw sand. It is a volunteer plant all along this coast and does not need to be planted. Marram grass is used to stabilise the rest of the foredune.

## Establishment of Marram Grass

Unlike spinifex, which has a trailing habit, marram grass is an erect, tall-growing grass. Though it cannot endure smothering to the same extent as spinifex, and hence is not so valuable to stabilise the area at the toe of the foredune, it is indispensable for the remainder of the dune complex. It can keep pace with fairly rapid sand accretion and because of its erect habit it is very valuable for breaking the force of the wind at ground level and causing the wind to drop its load of sand.

Unlike spinifex, marram grass does not occur naturally in the area and must be planted. An area of marram grass is burnt in early spring to get rid of the dead leaves and stems and to encourage fresh, vigorous spring growth. Early next winter, when the sand is moist and the rate of sand blowing is at a minimum, the marram plants are dug, trimmed uniformly to about 1ft., broken up into small pieces

Though they cannot be cultivated, sand ridges respond to surface sowing and topdressing, which are done by hand or by blower.



Left—Planting marram grass. The bunch is heeled into a spade slit. Right—A plant of spinifex. The long, trailing stems can regain the surface even when buried under masses of drifting sand.

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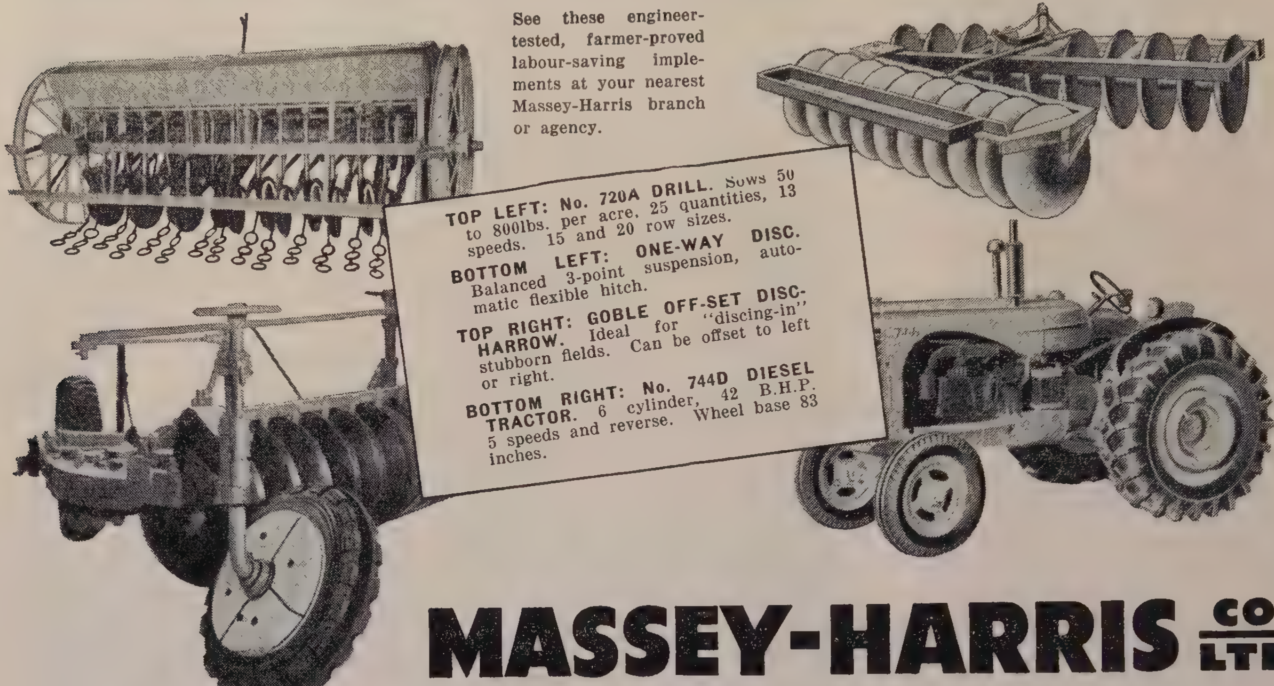

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A neglected break in a sand ridge. Unless remedial measures are taken, this break will spread.

each bearing a portion of root or rhizome, and planted out in the dune areas, preferably on the same day. The planting is done by making a slit in the sand with a spade and heeling a handful of marram grass into it. The usual spacing is 3 to 4ft. apart, with 3 to 4ft. between rows.

The area to be planted with marram grass includes part of the foredune and all the dune complex back to the plantation edge.

### Tree Lupins to Plantations

When the whole of the area has been planted with marram grass it is quite stable and can, if required, be turned into pine plantations. Pines establish very poorly among marram grass, and much better establishment can be secured under tree lupins. The recommended practice is to sow tree lupin seed among the marram grass, either at the time of transplanting or a year or two later. In 2 or 3 years, when the tree lupins are tall and have formed some litter on the ground, pines can be established. *Pinus radiata* grows well in sand country, though for the two or three rows nearest the sea it is often desirable to plant other species which are less affected by salt winds. *Pinus muricata* and macrocarpa are often used for this purpose.

Nothing much is gained by pushing the margin of the plantation too close to the sea, as the trees are severely affected by the salt winds. It is intended at Flock House to leave a strip of marram grass at least 200 to 300yds. wide between the plantation edge and the beach.

### Sand Stabilisation on the Farm

The problem of preventing sand from blowing is not confined to the dune complex, but is also of importance on the farm. In many of the paddocks there are high sand ridges that cannot be cultivated, and these present a particular problem, especially when the paddocks in which they occur have been cultivated and sown in high-producing pastures or feed crops. As the carrying capacity of the paddocks increases the ridges receive increased grazing and trampling, which may cause the sward to open up and may lead to the formation of a sand blow. A number of methods have been evolved to deal with this problem. In the worst cases the ridge is permanently fenced off from stock and planted in marram grass or trees. Small blows usually cover over satisfactorily if they are covered with tree branches or manuka brush and sown with a seeds mixture containing hardy, drought-resisting species such as *Danthonia pilosa* and subterranean clover. As a precaution against blowing it is customary to surface sow all sand ridges with a mixture based on subterranean clover, white clover, and perennial ryegrass, and to topdress the ridges regularly with "super. compound" by hand.

Kikuyu grass has been introduced along some roadsides which are heavily trampled by stock and gives promise of stabilising these satisfactorily. Many of the farm roads carry a heavy volume of traffic, and it has been found that the best way to prevent sand blowing from these is to spread them with gravel. Other preventive measures have been the planting of shelter belts to give protection from the wind, and a vigorous campaign to get rid of rabbits, which often cause sand blows by their burrowing. As far as is possible no newly ploughed or cultivated area is allowed to remain long in bare fallow and an attempt is made when forming new roads to avoid cutting across unstable-looking ridges. Adequate topdressing to increase the vigour of the sward and the introduction of lax grazing techniques, particularly in summer, to prevent the topsoil from drying out and to afford added protection from the wind have also proved of value in combating sand movement.

A break forming where a track had been cut across a sand ridge.

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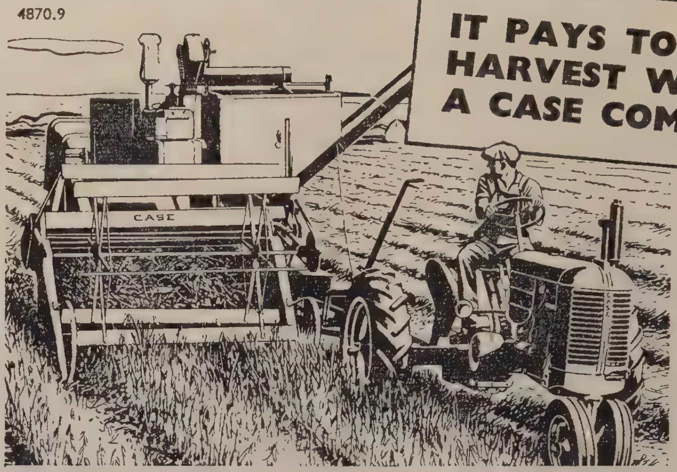

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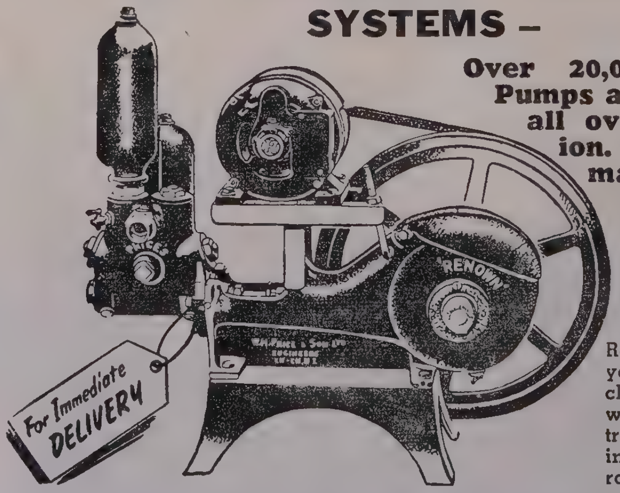

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# Packing Surplus Honey

## Seasonal Notes for the Domestic Beekeeper

IN most districts of New Zealand the apiary season will be drawing to a close and in some areas extraction of the honey crop will have been completed. Domestic beekeepers will now have to consider the granulating and packing of their crop. In this article T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton, discusses current work in the domestic apiary.

WHEN all the honey is packed the honey house should be given a clean up, the honey tank, strainer, extractor, etc., being washed and placed away where they will be protected from dampness or dust. Any part of the equipment that is likely to rust should be given a light coat of petroleum jelly to protect it.

### Granulating

After the honey has been extracted and strained it should be covered and left for a day or two. This will enable any wax particles and froth to rise to the surface. This material forms a thin layer on top of the honey which is removed by drawing it over to one side of the settling tank with a tablespoon and dishing it out with the spoon.

To ensure that the honey granulates quickly and with a fine grain it is advisable to add what is called a "starter". Methods of doing this are described by C. R. Paterson on page 116. This is very important for all honey intended for table use.

On numerous occasions a beekeeper has opened a tin of honey to show the writer how it has gone sugary or coarse grained, a condition that can be overcome even at that stage. It may be reliquefied by standing the container in a pot of hot water. The water is kept hot (about 140 degrees F.) until the honey is all clear liquid, and after it has cooled a starter honey is stirred into it, giving the same results as with freshly extracted honey.

### Packing

Honey should be packed as soon as possible after the starter has been stirred into it.

The type of container to be used will depend largely on whether the beekeeper intends marketing his crop. If it is to be kept for home use, there is usually a good assortment of odd jars to be found about the house; preserving jars are excellent containers.

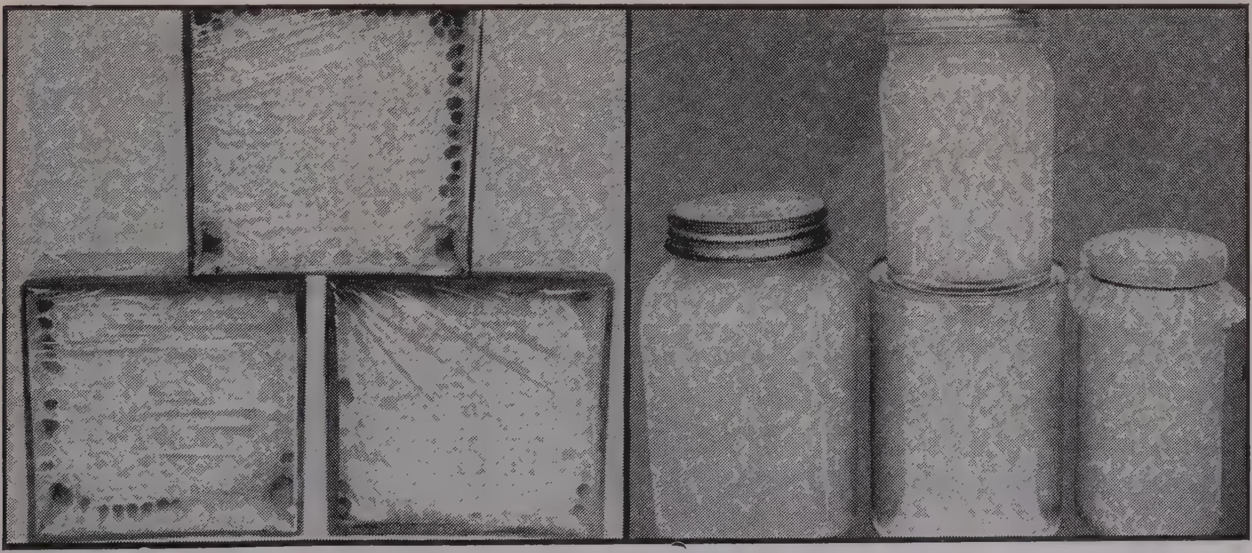
Great care should be taken, as honey is extremely sensitive to odours and can be quickly and irretrievably contaminated. For instance, a jar which has contained pickles should be thoroughly washed, especially the lid. The cardboard seal in the lid should be discarded and a new one cut out and fitted. A large tin is not a suitable container for domestic use, as it is constantly being opened to replenish the honey dish and may at times come into contact with damp air.

### Section Honey

Where the beekeeper raises section honey it would be advisable to remove the sections as soon as they have been completely capped over, for if they are left on the hive too long, they are likely to become travel stained by the bees and as the flow lessens the bees will begin to remove the honey from a few cells, so spoiling their appearance. When the sections are removed from the hive as little smoke as possible should be used, for the smoke will sometimes cause the bees to puncture the cappings of the sections.

Sections of comb honey are cleaned by scraping the propolis and beeswax from the wood with a knife.

Great care should be exercised when removing these delicate sections of comb honey from the holders, as the least knock will bruise the cappings and allow the honey to leak out and spoil their appearance. The wood around the honeycomb of each section should be cleaned carefully of propolis and beeswax. This work should be done over a suitable dish into which the scrapings drop. A knife or razor blade will remove the adhering materials. Any remaining stains may be removed with a piece of glass paper. If it is intended to market the sections, they should also be wrapped in transparent cellulose wrapping. A piece of such wrapping 12in. x 6in. is cut and laid out on the table. The section is then placed so that the bottom is in the centre of the wrapper, a little thin gum or paste is applied on top of the wood, and the wrapping is pulled up each side and each end is stuck to the wood; the sides are done in a similar manner. After a little practice a domestic beekeeper should be able to make a good job of wrapping.



Packing of surplus honey. Left—Sections of comb honey cleaned and wrapped in transparent cellulose. Right—The household supply may be packed in any suitable jars or tins. Transparent cellulose may be used to cover jars which have no lids.

# Cheaper Meat Dishes

IT is sometimes difficult to decide what the main meat dish of the day will be. Roasted or boiled joints are always appreciated, but they are among the more expensive cuts and this prevents their frequent use. However, many cuts are less expensive and when suitably cooked make appetising meals. More effort is needed in preparation to make them look attractive, but they are just as nutritious as the more expensive cuts and they represent a saving in the household budget. In this article by Molly Macpherson, Field Officer in Rural Sociology, Department of Agriculture, Auckland, a selection of recipes using the cheaper cuts of meat is given.

AS the meats used are generally less tender than the more expensive meats, it is important to cook them gently in moist heat to develop the full flavour and soften the tougher muscle. Additional flavour may be given by using spices or full-flavoured vegetables with the meat in preparation and cooking.

## Beef Dishes

### Meat Loaf

1½lb. of topside or chuck steak
1 lightly beaten egg
2 ½in. slices of bread (preferably stale)
1 small onion
½ cup of milk
½ teaspoon of salt
Shake of pepper
Pinch of chopped sage

Peel the onion and mince it, the steak, and the bread. Add the egg, milk, and seasonings. Mix well and press into a greased loaf tin. Bake in a moderate oven at 350 degrees F. for 1 hour. Turn the loaf on to a warmed serving dish and garnish suitably. (6 to 8 servings.)

**Suggestions for vegetables:** Baked potatoes, carrot slices in parsley sauce, and silver beet.

### Hash

1 cup of stock or water
1lb. of blade steak or 1lb. of corned brisket
1 teaspoon of mustard
3 tablespoons of fat
2 teaspoons of salt (omit if using corned brisket)
2 large onions
Good shake of pepper
½ cup of rice

Peel and slice the onions. Mince the steak (or corned brisket). Heat the fat in a saucepan and brown the onions in it. Add the mince and brown it gently. Add the washed rice and seasonings and stir well. Add the stock and cook gently for 1 hour, stirring from time to time. The fat and stock should all be absorbed into the hash when it is cooked.

**Suggestions for vegetables:** Mashed potatoes, white turnips, and tomatoes (either cooked or preserved).

### Camp Pudding

½lb. of shoulder bacon
1½lb. of shin of beef
1 egg
Salt, pepper
1 tablespoon of chopped parsley

Remove the rind from the bacon and the fat and gristle from the shin beef. Mince the shin beef and the bacon. Add the seasonings, parsley, and egg and mix thoroughly. Press into a basin and cover the top with greaseproof paper. Place in a pot of boiling water and steam for 2 hours. Allow to cool overnight. Unmould and garnish. Serve in wedges as for steamed pudding.

**Suggestions for vegetables:** New potatoes and lettuce salad.

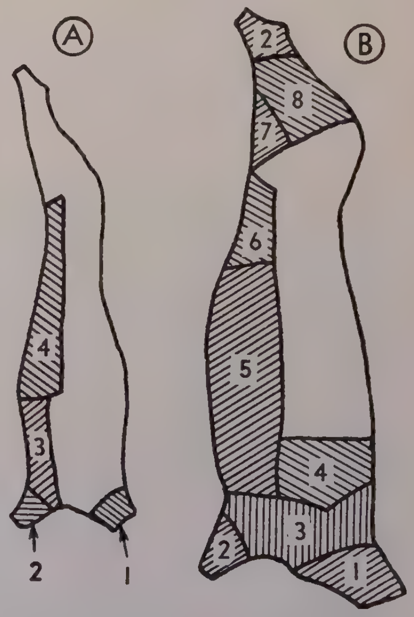
### Stuffed Steak

2lb. of topside

### Stuffing

1 cup of breadcrumbs
1 medium-sized onion
Sage
Thyme
2 tablespoons of fat
2 tablespoons of boiling water

Chop the onion and the fat finely. Mix all the ingredients. Cut a pocket in the steak and fill it with the stuffing. Sew up the opening with strong thread or fine string. Brown in a little



The shaded portions of the diagrams indicate the cheaper cuts of meat. A—Lamb or mutton: 1—Neck. 2—Shank. 3—Breast. 4—Flap. B—Veal or beef: 1—Neck. 2—Shin. 3—Chuck. 4—Blade. 5—Brisket. 6—Thin flank. 7—Thick flank. 8—Silver side or topside (inside leg).

fat in a saucepan. Draw aside from the heat and carefully add 1 cup of water. Return to the heat and cook for 2 hours. Remove the meat and skim the fat from the liquid. Make gravy with the liquid.

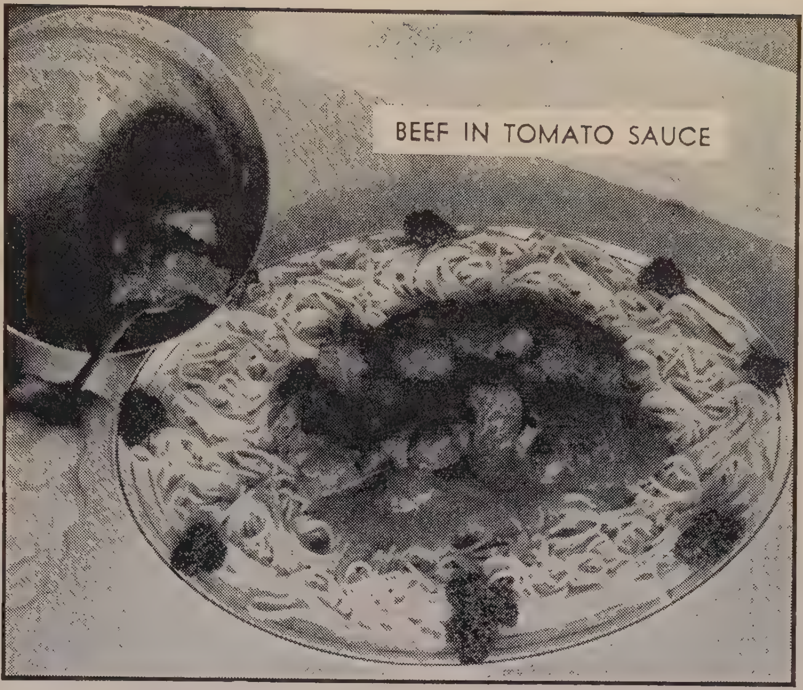
**Suggestions for vegetables:** Mashed potatoes, cubed swede, and cabbage.

### Beef in Tomato Sauce

1½lb. bolar steak or blade steak
3 tablespoons of flour
1½ teaspoons of salt
½ teaspoon of pepper
2 large onions, chopped finely
4oz. of vermicelli
2 tablespoons of fat
2 cups of tomato puree
½ teaspoon of cloves
½ cup of water or stock

Mix the flour, salt, and pepper. Melt the fat in a saucepan. Cut the meat into small pieces and coat with the flour mixture. Brown the meat in the fat. Add the onions and cook gently. Add the tomato puree, cloves, and water and stir. Cover the saucepan and simmer the meat for 2 hours. A quarter of an hour before serving cook the vermicelli in boiling salted water. Drain the vermicelli and arrange it on a hot serving dish. Serve the stew on the vermicelli. (6 servings.)

**Suggestions for vegetables:** Mashed potatoes, peas, and marrow.


BEEF IN TOMATO SAUCE

## Mutton Dishes

### Cold Rolled Stuffed Flap

2lb. of flap of mutton (in two pieces)

**Stuffing**

1½ cups of bread-crumbs
1 medium-sized onion, chopped finely
Thyme
Pepper
1 teaspoon of salt
2 tablespoons of fat
Pinch of allspice
2 tablespoons of boiling water

Mix all the stuffing ingredients. Divide the mixture in halves and spread half on each flap. Roll up and tie the flaps. Roll in greaseproof paper and cook in a pressure saucepan at 15lb. pressure for 30 minutes. Allow to cool. Remove the paper and press in a pie-dish under a weight. (8 servings.)

**Suggestions for vegetables:** New potatoes and lettuce salad.

### Curry

2lb. of breast of mutton
2 medium-sized onions, peeled and sliced
2 medium-sized apples, peeled and sliced
½ cup of sultanas
1 tablespoon of flour
1 heaped teaspoon of curry powder
12 prunes, soaked in 1 cup of hot water for at least 1 hour
2 tablespoons of fat
1 cup of water or stock
1 teaspoon of salt
Pepper

Melt the fat in a saucepan and brown the cut-up meat in it. Add the onions, apples, curry powder, flour, salt, and pepper. Cook for 5 minutes, stirring gently. Add the sultanas and the stoned prunes with the water in which they were soaked. Add the stock and stir gently. Simmer for 1½ hours, stirring from time to time. Serve with boiled salted rice and chutney.

**Suggestions for vegetables:** Cauliflower, carrots, and parsnips.

### Irish Stew

1lb. of breast of mutton
2lb. of potatoes
2 large onions
1 cup of stock
Good shake of pepper
1 teaspoon of salt

Cut the mutton into neat pieces and place it in a saucepan. Add the stock, salt, and pepper. Bring to the boil and boil 5 minutes. Set aside and skim. Continue cooking for ½ hour. Peel and slice the potatoes and onions and arrange in layers on top of the stew. Cook gently for another hour.

**Suggestions for vegetables:** White turnips, leeks, and carrots.

### Mutton Shape

1lb. of neck chops or 1lb. of flap
1 pint of stock
1 slice of bacon
1 large onion, peeled and sliced
1 teaspoon of salt
1 tablespoon of lemon juice
1 dessertspoon of gelatine
1 tablespoon of chopped parsley

Cut the rind from the bacon. Put the neck chops (cut in halves), bacon, stock, onion, and salt in a saucepan and bring to the boil. Boil gently for 1 hour or until the meat is tender. Remove the meat from the liquid and shred it finely. Skim the fat from the liquid and add the gelatine, parsley, and lemon juice to the liquid and mix well. Put the meat into a wetted mould and pour the liquid over it.

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**Suggestions for vegetables:** Cucumber and tomato salad, peas, and potatoes.

### Mutton Pasties
#### Pastry

½lb. of flour
¼ teaspoon of salt
¼lb. of lard

Cut the lard into the flour and salt until it is the consistency of fine breadcrumbs. Mix it to a fairly stiff paste with water. Roll out to ¼in. thickness and cut into rounds, using a 6 or 8in. plate or pot lid. Put the filling (ingredients and instructions for which are given below) on one half of the circle and turn the other half of the pastry over it. Crimp the edges together and cut a cross in the pastry. Slide on to an oven slide, using a fish slice. Bake for ½ hour at 400 degrees F. (hot oven).

#### Filling

2lb. of mutton trimmings or flap or neck or leg chops
½lb. of carrots
½lb. of swede
1 teaspoon of salt
1 large onion
1 cup of stock

Cut the meat finely and put into a saucepan with the stock. Bring to the boil and cook for ½ hour. Add the vegetables, finely chopped, and the salt. Cook for 20 minutes. Thicken with flour if necessary.

**Suggestions for vegetables:** Cabbage, parsnips, and potatoes.

TRIPE FRITTERS

## Veal Dishes

### Breslau of Veal

1lb. of minced veal flank
1 cup of stock
2 tablespoons of fat
1 cup of milk
½ cup of breadcrumbs
1 tablespoon of chopped parsley
1 teaspoon of salt
1 teaspoon of Worcestershire sauce

Simmer the veal in the stock for 1 hour. Combine the other ingredients and turn the cooked veal mixture into them. Mix thoroughly and put in spoonfuls in greased patty pans. Bake in a moderate oven at 350 degrees F. for 30 minutes. Turn the patties on to a hot serving dish and serve with tomato sauce. (6 to 8 servings.)

**Suggestions for vegetables:** Diced swede, baked potatoes, and cabbage.

### French Veal

1lb. of veal flank
½lb. of onions
2 medium carrots
4oz. of flour
2 teaspoons of sugar
1 teaspoon of salt
⅛ teaspoon of pepper
2 tablespoons of vinegar
Pinch of cloves
Pinch of baking soda

Cut the meat into neat pieces, removing the fat. Mix the flour, sugar, salt, baking soda, pepper, and cloves and place with the meat in a basin. Knead the flour mixture into the meat. Place the meat in the bottom of a large casserole and sprinkle the vinegar and any remaining flour over it. Scrape and slice the carrots and arrange them over the top of the meat. Peel the onions, slice them very thinly, and arrange them over the top of the carrots. Pour ½ cup of cold water over the onions. Cover the casserole and cook it for 1½ hours in a moderate oven (350 degrees F.). Tree tomato slices may be used instead of carrots. (4 to 6 servings.)

**Suggestions for vegetables:** Baked potatoes, parsnips, and brussels sprouts.

FRENCH VEAL

### Veal Birds

1lb. of brisket

#### Stuffing

1 cup of breadcrumbs
2 tablespoons of chopped fat
½ teaspoon of salt
Good shake of pepper
2 tablespoons of boiling water
1 small apple, peeled and grated

Slice the brisket thinly into four even-sized pieces. Mix the stuffing and spread each piece of veal with stuffing. Roll up and fasten with a toothpick. Brown gently in a little hot fat and then cook in a pressure saucepan for 15 to 20 minutes. If using a pot, cook for 1 hour. (4 servings.)

**Suggestions for vegetables:** Boiled potatoes, marrow, and onions in white sauce.

### Poached Veal Patties

1lb. of veal brisket
4oz. of suet
2 thick slices of stale bread
2 tablespoons of milk
2 eggs
Juice and rind of a lemon
1 teaspoon of salt
Pepper
½ teaspoon of nutmeg

Mince the bread and soak it in the milk. Mince the veal and suet and combine them with the bread and other ingredients. Shape into flat patties and allow to stand for ¼ hour. Poach the patties in gently simmering stock flavoured with celery leaves for 20 minutes. Remove the celery leaves and thicken the stock. (4 servings.)

**Suggestions for vegetables:** Potatoes, pumpkin, and celery.

### Pressed Veal

2lb. of veal flank
2 slices of bacon
½ cup of dry bread-crumbs
2 tablespoons of melted fat
1 egg lightly beaten
Salt and pepper to taste
1 teaspoon of chopped sage

Trim the rind from the bacon. Mince the veal and bacon. Add the other ingredients and mix well. Press into a greased loaf tin. Bake in a slow oven at 325 degrees F. for 3 hours. Allow to cool thoroughly. Remove from the tin and garnish with lettuce leaves.

**Suggestions for vegetables:** Potatoes, peas, and beans.

## Miscellaneous Dishes

### Heart Stew

4 sheep hearts
2 large onions
2 carrots
1 small swede
2 tablespoons of flour
1 teaspoon of salt
Pepper to taste

Wash and trim the hearts and cut into small pieces. Mix the flour, pepper, and salt. Coat the pieces of heart with the seasoned flour and brown gently in a little hot fat in a pressure saucepan. Peel and slice the onions and add them to the mixture in the saucepan. Cook gently, stirring from time to time till the fat is absorbed. Pour 1 cup of water into the saucepan. Add the peeled and diced carrots and swede. Close the saucepan and bring to pressure. Cook for 30 minutes. Reduce the pressure. Thicken the gravy if necessary. If using a saucepan, cook for 1½ hours. (4 servings.)

**Suggestions for vegetables:** Boiled potatoes, beans, and pumpkin.

### Tripe and Onions

1lb. of tripe
2 onions
1 teaspoon of salt
Pepper
1 cup of milk
2 tablespoons of flour
Chopped parsley

Scrape any fat from the tripe and cut it into neat pieces. Place in water, bring to the boil, and boil for 20 minutes. Pour off the water. Add the peeled, sliced onions, salt, pepper, and sufficient water to cover. Bring to the boil and simmer gently for 1 hour. Pour off the water. Add the milk and bring to the boil. Thicken the mixture with the 2 tablespoons of flour mixed to a thin paste with a little water. Cook for 5 minutes. Add the parsley and cook for a further 2 or 3 minutes. The total cooking time should be 1¾ hours. (4 servings.)

**Suggestions for vegetables:** Potatoes, carrots, and cabbage.

### Tripe Fritters

1lb. of tripe
1 teaspoon of salt
1 teaspoon of cloves

#### Batter

1 cup of flour
1 teaspoon of baking powder
1 teaspoon of vinegar
½ teaspoon of salt
1 egg beaten in ½ cup of milk

Sift the dry ingredients for the batter together. Make a well in the centre and add the egg and milk. Fold the mixture in, and last stir in the vinegar. Leave for ½ hour at least before using.

Scrape any fat from the tripe and cut it into neat pieces about 2in. square. Place in water and add the cloves and salt. Bring to the boil and boil ½ hour. Drain the tripe. Dip the pieces in the batter and fry in deep fat until they are golden brown. Serve with sliced lemons. (4 to 6 servings.)

**Suggestions for vegetables:** New potatoes, green beans, and carrot spears.

### Braised Kidneys

1½lb. of ox kidney
2 onions
1 swede
2 carrots
2 stalks of celery
1 cup of stock
6 rashers of bacon

Cut the kidney into medium-sized pieces and brown it gently in a saucepan in a little hot bacon fat. Peel the onions, carrots, and the swede and slice them thinly. Wash the celery stalks and chop them finely. Add the vegetables to the saucepan and brown them lightly. Pour off any surplus fat. Add the stock, cover the saucepan, and simmer the stew for 45 minutes. Thicken the gravy and grill the bacon. Arrange the bacon round the sides of a hot serving dish and pile the kidney stew in the centre. (6 servings.)

**Suggestions for vegetables:** Potatoes, pumpkin, and brussels sprouts.

### Liver Hot-pot

1lb. of lamb fry
2 slices of bacon
1lb. of onions
1 carrot
1 parsnip
1lb. of potatoes
2 tablespoons of flour
1 cup of stock
½ teaspoon of pepper
Pinch of cayenne

Trim the rind from the bacon and cut it into four pieces. Put these in a cold saucepan and cook gently. Cut the lamb fry into neat pieces. Add the seasonings to the flour and coat the fry with this mixture. Brown the fry in the saucepan with the bacon. Peel and slice the onions and brown them also. Pour off any surplus fat. Add the diced carrot and parsnip, the stock, and any of the flour mixture left from coating the liver. Cover and simmer for 20 minutes. Peel the potatoes and slice them thinly. Arrange in layers on top of the liver stew. Cook for a further 20 minutes or until the potatoes are done. (4 to 6 servings.)

**Suggestions for vegetables:** Pumpkin, cauliflower, and kumaras.

All photographs by Sparrow Industrial Pictures Ltd.

## Fish Croquettes

THE ingredients for making fish croquettes are 1 tin of salmon or ½lb. of cooked white fish, 3 or 4oz. of creamed potatoes, 2 tablespoons of thick white sauce, a pinch of mixed herbs, seasoning, a few drops of anchovy essence (optional), and a beaten egg and crumbs for coating.

If fresh fish is used, cook it with a few drops of vinegar and a small bay leaf to improve the flavour. Use the cooking liquor to make the white sauce described below. Flake the cooked fish, removing any bones and dark skin and blend it with the creamed potatoes. Stir in white sauce, mixing it well, and adjust the seasoning to taste. Add the anchovy essence before the seasoning. Leave the mixture until it is cold before shaping it with floured hands. Then brush it over with beaten egg and coat with crumbs, pressing them on firmly.

Fry the croquettes in deep fat or bake them on a greased dish in the oven. Serve them with small whole tomatoes, raw or grilled.

**White sauce:** ¾oz. of butter melted in a saucepan into which is stirred a level tablespoon of flour. Add very gradually 2 or 3 tablespoons of fish liquor and milk, stirring and beating after each addition until the sauce is smooth. Season generously.

# Perennial Borders in Flower Garden in Autumn

By H. P. THOMAS, Horticultural Instructor,
Department of Agriculture, Wanganui

PERENNIALS are those plants which have a life of more than 2 years and these may be further divided into herbaceous and woody kinds. In New Zealand because of the limited space in most flower gardens and also a desire to have some colour throughout the year it is not unusual in the herbaceous border to make provision for plantings of the best annual and biennial plants as well as utilising many woody perennials such as shrubs. The plants may therefore be more aptly termed perennial or mixed borders.

EURYOPS TENUISSIMUS (OTHONNA)

[Douglas Elliott photo.

HERBACEOUS perennial is the term applied to the large class of plants whose top growth dies down in autumn but whose roots survive winter to send up fresh growths in spring. Included would be those plants which grow year after year from bulbs, tubers, rootstocks, or stools, although to the horticulturist the term is usually confined to those which grow from root crowns, having more or less fibrous roots and increasing each year by producing other crowns round the parent plants.

Representatives of these deservedly popular perennial plants may be found in most gardens, large or small, either massed or in conjunction with other plants and shrubs in large beds called borders; or planted on a smaller scale according to the space available. With few exceptions they are very hardy, and their value and usefulness are well known because of their display both for ornamentation in the garden and for the provision of cut flowers in the home.

In addition the easy propagation of most of these plants by division of the rootstock adds greatly to their value.

During autumn the chief work in perennial borders will be the gradual removal of withered flower heads and any yellowing top growth to prevent untidiness reducing the appearance of the late-flowering kinds. Further the removal of spent flower heads may help to extend the flowering season. Supporting stakes and ties should be removed immediately they are no longer needed. As the sap from the top growth returns to strengthen the crown from which the following season's growth is produced, it is advisable to remove foliage gradually as yellowing occurs. A good deal of energy will also be lost to the rootstock if the plants are allowed to produce too many seed heads.

When spent growth is being cut it should not be dragged off with blunt tools, as the crowns are likely to receive injuries which will retard future growth. Healthy prunings from herbaceous plants provide useful material for building up the compost heap, but if they are diseased, they should be burnt.

In southern districts of the South Island where soils are heavier and severe winters may be experienced there are a few perennials whose fleshy roots may require earthing up or covering for protection against frost; for example, *Dicentra spectabilis*, *Lobelia cardinalis*, anchusa, and verbascum.

Annual growths of the following shrubs may be pruned back to within a few inches of the old wood in autumn or winter to encourage young flowering wood: *Buddleia variabilis*, *Hydrangea paniculata*, *Tamarix gallica*, spiraea, and golden-leaved elderberry.

Weeding should not be neglected and hoeing should be done whenever the state of the ground permits.

## Renovating the Borders

When perennial plants have been in the border for 2 or 3 years renovation of part or all of the border should be done at this time of year.

Although most perennials will continue to grow indefinitely, for best results they should be lifted, divided, and replanted at intervals according to their habit of growth.

However, there are some subjects which do not make fibrous roots and react unfavourably to being disturbed. If the clumps are looking well and showing no signs of deterioration, it will not be necessary to take them up as regularly as advised for others. Among those which could be placed in this group are peony, gypsophila, dictamnus, tritoma, geum, heuchera, and *Romneya coulteri*.

Many clumps of the vigorous-growing varieties such as helenium, rudbeckia, helianthus, solidago, and

[Douglas Elliott photo.

An outstanding variety of gypsophila is Bristol Fairy, which requires ample room and a fairly rich and freely limed soil. A most useful perennial for indoor and outdoor home decoration.

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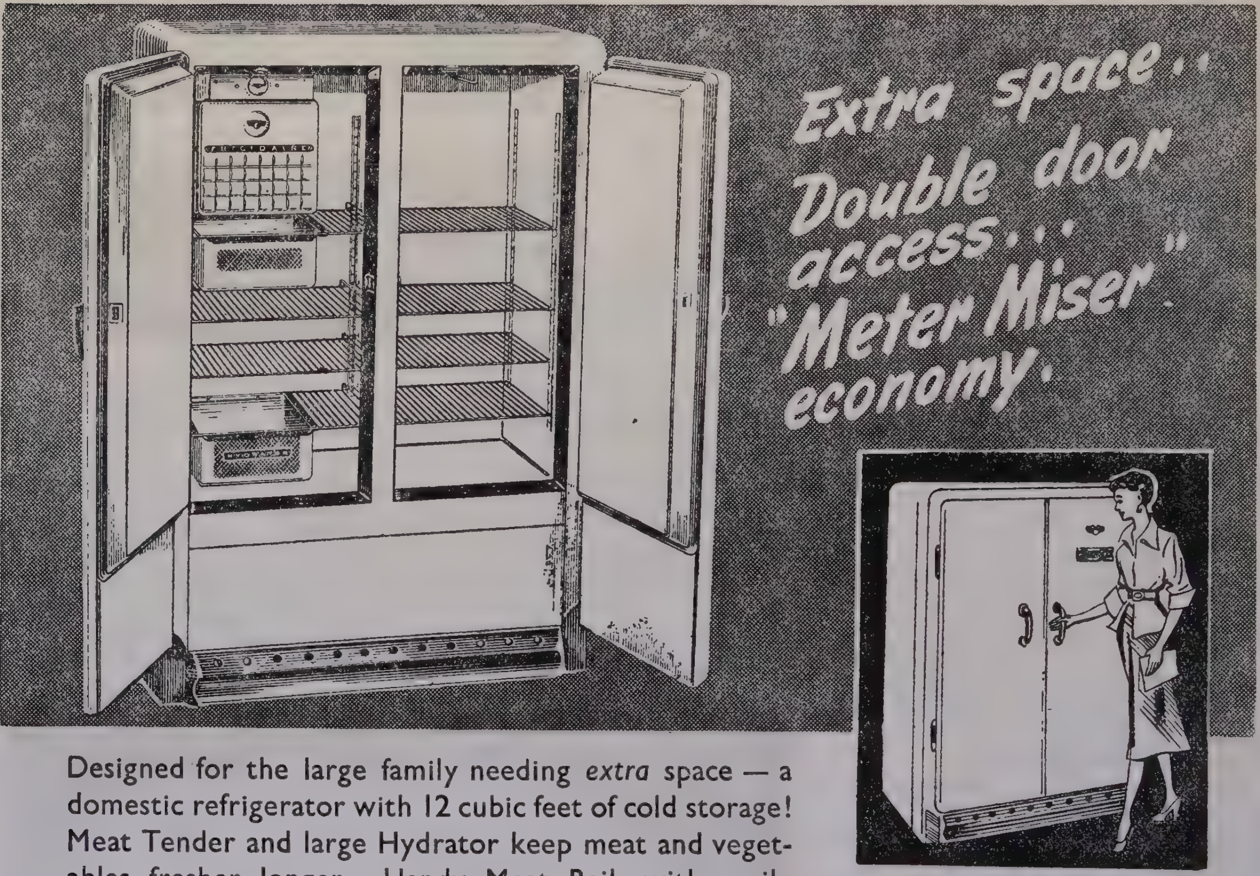

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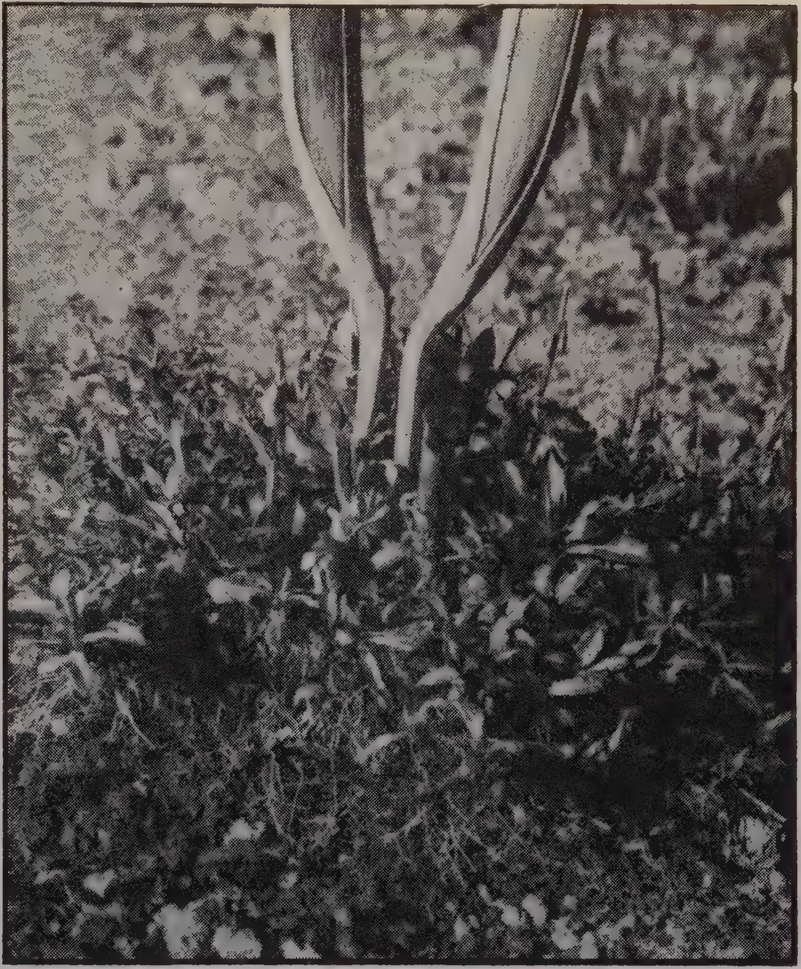
perennial aster (Michaelmas daisy) will be showing signs of degeneration through becoming too large, and this will indicate that they should be attended to.

If this periodic lifting is neglected, the strong-growing varieties will produce smaller flowers and a correspondingly poorer display, because of the congestion and excessive growth to be supported.



[*Green and Hahn Photography Ltd. photo.*

Many perennial roots such as perennial aster (Michaelmas daisy) shown above become too large because of their natural vegetative means of perpetuating themselves, and every third year at least the rootstock requires splitting up for best results.

## Division of the Rootstock

When the plants are divided smaller pieces of young vigorous growths from the outside of the clumps should be removed and kept for replanting. Rootstocks too large and compact to pull apart by hand can be divided with the aid of two large garden forks with prongs placed back to back, the handles being levered inward to force the roots apart. In some cases a knife cut may be needed to assist in this operation, but care should be taken to avoid any unnecessary damage to plant roots. The young plants should be immediately heeled in in a nearby piece of ground preparatory to replanting. Although planting may be carried out from April to September, the ground should be prepared in autumn and be ready for planting from mid-April to the end of May. If the weather and soil conditions are suitable, the newly selected plants may be replanted immediately.

## Cuttings

Border plants which do not divide readily may be increased by cuttings in early spring. There are a few, however, which may be increased by cuttings taken in autumn, of which examples are *Nepeta mussini*, pentstemon, dianthus, calceolaria, geranium, aubrietia, viola, pansy, verbena, and some of the salvias. With the exception of geraniums, which do not need shading or coddling and require less watering, the balance of the cuttings are made 3in. to 4in. long from young, firm shoots (not showing developing flower buds). These are taken with a heel or cut immediately below and a little above a node and inserted in a sandy compost in boxes, pans, or pots. They are then watered and placed in a closed frame and shaded from sunlight. With attention to watering and ventilation they will be well-rooted plants by spring. Some perennial plants with fleshy roots are propagated by root cuttings in autumn or winter. Cuttings of firm roots 2in. to 3in. long laid horizontally ½in. to 1in. deep in a mixture of peat and coarse sand in a cool position give the best results; examples are Oriental poppies, anchusa, peonies, gaillardias, *Romneya coulteri*, verbascum, physalis, and eryngium.

## Soil Preparation

### Renovated Borders

Whenever any plants are taken up for rearrangement or division the ground should be dug thoroughly as if the whole border was being attended to. If the space is small, for convenience the topsoil may be put into a barrow while the lower layer is forked over and enriched with decomposed organic material and fertilisers.

If the border is not due for a complete overhaul, benefit can be gained during the intervening years by dressing it with compost, decomposed farmyard manure, or a complete fertiliser which should then be lightly pricked in round the plants with a fork to avoid unnecessary damage to the roots. This is particularly beneficial round plants which are semi-permanent and which have not been removed for several years.

Just as the present month is the best time for remodelling an established perennial border, so also is it an opportune time for making a new one.

### New Borders

The ideal soil requirement for most shrubs and border plants is a rich, medium, well-drained loam, but relatively few gardeners are fortunate enough to have such a soil.

The provision of correct drainage is a first consideration with soils of a less favourable character. Most borders in the flower garden are of a permanent or semi-permanent nature and their success depends largely on the thoroughness of their initial preparation. The site or sites chosen should be dug over to a depth of at least 2ft. and the second spit or layer broken up with a fork and materials added according to the soil type.

On light soils well-decomposed farmyard manure is ideal, but as a substitute clay, leafmould, or decayed vegetable matter from the compost heap should be liberally supplied to improve soil texture as well as fertility.

On heavy clay soils long strawy manure, compost, wood ashes, coarse sand, and even road grit can be used not only for manurial purposes, but also to keep the soil open to facilitate drainage and aeration so that a better tilth is obtained for plant growth.

## Arrangement of Borders

There are many ways of arranging a flower border, from all of which something can be learnt. As a continuous display of flowers is the aim of most flower gardeners, the plants or shrubs selected must bloom for as many months of the year as possible. If the border can be made 12ft. wide, a row of shrubs could be accommodated at the back and about two-thirds of the bed reserved for perennials, supplemented by bedding plants.

If the border cannot be made wide enough to accommodate all these, and

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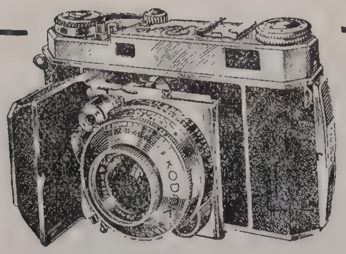

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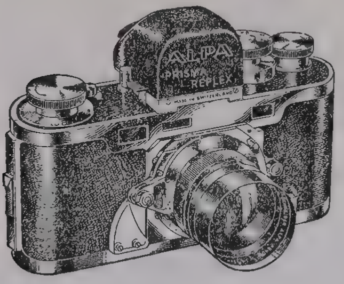

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more space is available elsewhere for beds, it would be advisable to have one bed devoted to shrubs alone and another to perennials and bedding plants, in which case the shrubs in a separate border can be profitably interplanted with other showy perennial, biennial, or annual plants for the first year or two.

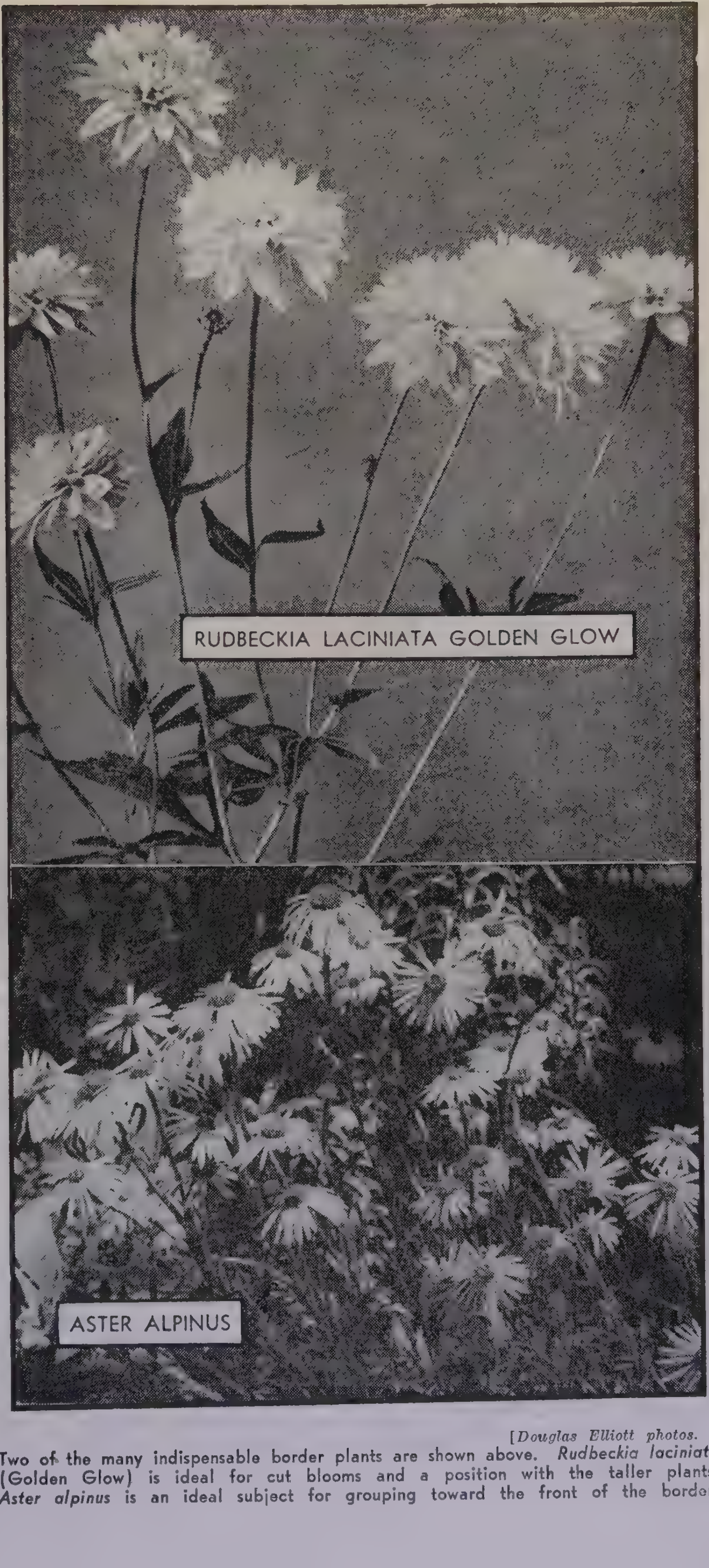
The true herbaceous border should not be less than 6ft. wide and should have a curved rather than a straight edge for best effect.

In the average scheme there are several indispensable kinds of plants such as helenium, rudbeckia, lupin, phlox, delphinium, pyrethrum, scabious, perennial aster, and peony which should be placed at regular intervals throughout the border to maintain a proper balance. In the same way vacant areas should be left at intervals for the sowing or planting of annuals, and in this respect the spaces should be between groups of plants which flower before the annuals. Pyrethrum, geum, doronicum, hemerocallis, and trollius can form such groups. Frequent plantings of bedding plants (annual and biennial) will assist in maintaining some colour in the border and their value should not be overlooked. The grouping of several plants of one variety in large borders is much more effective and gives more colour than if they were planted as single specimens. To avoid formality some of the tall plants usually allotted to the back of the border may be brought toward the front to form bays which can be occupied by choice varieties of lower-growing plants such as dwarf phlox, geums, and trollius.

### Planting

Shrubs and perennials may be planted over a period of several months beginning from late autumn (April) to early spring (September) if the soil is in a workable condition. Planting should not be attempted unless the ground is moderately dry and in a good friable condition. Autumn planting is recommended for both shrubs and perennials, as even in the colder districts the soil is in more suitable condition and plants have a reasonable chance of becoming established before winter sets in. In addition a better selection is to be had from nurserymen and if the spring is dry, these autumn-planted borders are less apt to suffer from drought. If the border is a mixed one, biennials as well as perennial plants may be set out at this time of year if space is available. Spring-flowering bulbs, if desired in the border, may also be planted in groups at this period of year. The question of distance apart for planting perennials is not an easy one, as so much depends on the fertility of the soil and the ultimate height of the plants.

Plants growing up to 18in. high may be planted 1ft. apart, those 18in. to 2½ft. 2ft. apart, and those 2½ft. to 4ft. or more not less than 3ft. apart. These suggestions apply to the distances between the groups of plants to allow for picking, staking, and weeding in summer. A distance of 12in. to 18in. for individual plants in the group would probably be suitable for all but the most spreading types. Any mistakes made in respect to planting distances, heights, colours, or flowering dates of the subjects should be written down in a notebook during the growing season and remedied the following autumn.



[*Douglas Elliott photos.*

Two of the many indispensable border plants are shown above. *Rudbeckia laciniata* (Golden Glow) is ideal for cut blooms and a position with the taller plants. *Aster alpinus* is an ideal subject for grouping toward the front of the border.

Standard varieties which have proved themselves reliable and useful for many years should be chosen first for new plantings. A start may be made with a small outlay and in a short time surplus plants will soon be available for planting in other parts of the garden or for giving away.

## Other Work for the Month*

March is recommended as the time to put down a new lawn or to carry out some improvements on established lawns.

Experience has shown that if lawns are sown down in autumn, the seed will germinate more quickly, establish better, and be more free from weeds than if the lawn is sown in spring. It is advisable to have the soil thoroughly worked and evenly firmed well in advance and if this has been done, the recommended seed mixture to apply is 2 parts of New Zealand chewings fescue to one part of Government Certified browntop sown evenly at the rate of 1oz. of the mixture to a square yard.

In established lawns any slight irregularities of the surface may be levelled out by topdressing with sifted soil (preferably sterilised), but where depressions are very marked the sections of turf should be carefully lifted and replaced after soil has been added beneath to raise it to the required level.

During March a mixture of 3 parts of sulphate of ammonia and 1 part of superphosphate may be applied at 1oz. to the square yard and thereafter every 3 months as required to maintain healthy growth.

Spiking, which should be done carefully with a garden fork, has a beneficial effect on lawns which have become too consolidated. The turf should be perforated at 2in. or 3in. intervals by driving the fork vertically into the soil and withdrawing it without damaging the turf, and thereby increasing aeration and also improving the drainage.

Many shrubs and hedge trees may be propagated successfully in autumn or early winter by outdoor plantings of hard-wood cuttings which are made from the firm, well-ripened growth of the previous season. The following are some of those which may be propagated in this manner: Escallonia, privet, olearia (and most hedge trees), veronica, ribes, forsythia, senecio, tamarisk, prunus, philadelphus, willow, and poplar.

**Sweet peas:** An autumn sowing of sweet peas may be made now in a specially prepared site which should have been trenched and enriched by the addition of some organic material and complete fertiliser. Liming is usually necessary also.

**Gladioli** should be lifted and dried off when the leaves show a marked change in colour. When they are properly dried off they can be prepared for storage by removing the tops 1in. to 2in. above the corm, and removing the young corms and old shrivelled ones at the base. The new corms, which should not be removed entirely from their outer skins, should be stored in a cool, dry, airy place.

**Turves** can be gathered and stacked from a paddock or area which has grown grass well for some years. These should be stacked with the grass-side down, and by the spring the heap should provide good fibrous loam, an excellent basis for bedding plant and potting soil.

**Roses:** Special attention should now be given to the preparation of beds or borders for the planting of roses bushes. Roses prefer a deeply worked fairly stiff loam which does not dry out readily in summer. Most soils should be dug at least 2ft. deep and enriched by the addition of well-rotted animal manures and bonedust, or compost.

**Chrysanthemums** grown in pots in the districts where early frosts are experienced should soon be moved indoors to avoid injury to the developing flowers.

**Bulbs:** The planting of popular spring-flowering bulbs may be made now; for example, narcissi, tulips, hyacinths, crocuses, freesias, lachenalias, ixias, sparaxis, and babianas.

**Flower seeds** may now be sown outdoors, if required, as follows: Calendula, larkspur, viscaria, Iceland poppy, myosotis, sweet pea, and antirrhinum. These plants are sufficiently hardy to withstand the winter and make a welcome show in early spring. Some light initial thinning of the plants may be required, but it is advisable to delay final thinning until the end of winter, as losses may occur.

**Wallflowers** and other biennials should be wrenched preparatory to planting out in April for the early-spring bedding display.

**Compost:** Preparations should be made for the composting of fallen leaves and flower garden refuse as it becomes available.

**Carnation** layers which were put down during mid-summer should now be well rooted, and they may be severed from the parent plant and planted where required.

◆◆

## Use of Weedicides on Lawns

Multi-crown of dandelion growing from a taproot which had been cut with a knife below a lawn surface.

It is surprising how many people still rely on the knife as an implement for removal of weeds from lawns instead of using the weedicide that is most appropriate for the purpose. Most lawn weeds can be killed with one of the hormone preparations of M.C.P. and 2,4-D. The most suitable preparations are the water-based salts and amines. These preparations are readily washed from the sprayers after use and do not cause damage to garden plants by volatile fumes. Oil-based esters of 2,4-D, on the other hand, contaminate spray equipment and under hot temperatures the volatile forms of these esters pass off toxic fumes that may cause damage to most garden plants. All hormone preparations, however, must be employed so that spray drift is avoided. Spray drift is minimised by using a large volume of water at low pressure and applying the spray when the wind is negligible. Most satisfactory results are obtained if the lawn is not mown for a week before applying the spray. The same period should elapse after spraying before the lawn is mown. Half a fluid ounce (1 tablespoon) of M.C.P. or 2,4-D preparation in a gallon of water to 25 sq. yds. forms a suitable spray solution for most types of spray equipment.

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* This section has been prepared by C. K. Ellis, formerly Horticulturist, Department of Agriculture, Dunedin.

# New Clothes for Children from Adults' Discards

VERY often clothes have to be discarded before they are worn out, because they are unfashionable, are marked or faded, or have been attacked by moths or torn in a conspicuous place. Before they are consigned to the rag bag it is a good idea to consider them as possible sources of material for children's garments. If there are large pieces of good material in them, this step may well be worth while, and in this article Eirene E. Unwin, Field Officer in Rural Sociology, Department of Agriculture, Christchurch, gives details and diagrams of methods of making such garments. If they are old garments being discarded because they really are worn out, it will seldom be advisable to spend time and labour on cutting them down, as the material, even in the apparently unworn parts, will stand up to very little more use.

IT cannot be over-emphasised that the making of children's clothes from garments that are really worn out is not advised. It takes just as long to make such clothes from weak as from strong material, but it takes almost no time at all for those made from thin, old material to wear out and become useless, and the labour involved in making them is wasted. The garments which are probably least likely to be of use for making into other garments when worn out are men's trousers and jackets. If they are of really heavy material, there will, it is true, be several pieces of good cloth in them, even when knees, seats, elbows, fronts, and cuffs are worn through, but these pieces are so small in relation to their weight that any garment made from them would be too heavy for its size. Pieces from these clothes are best kept for patches, and are often better than new cloth for this purpose.

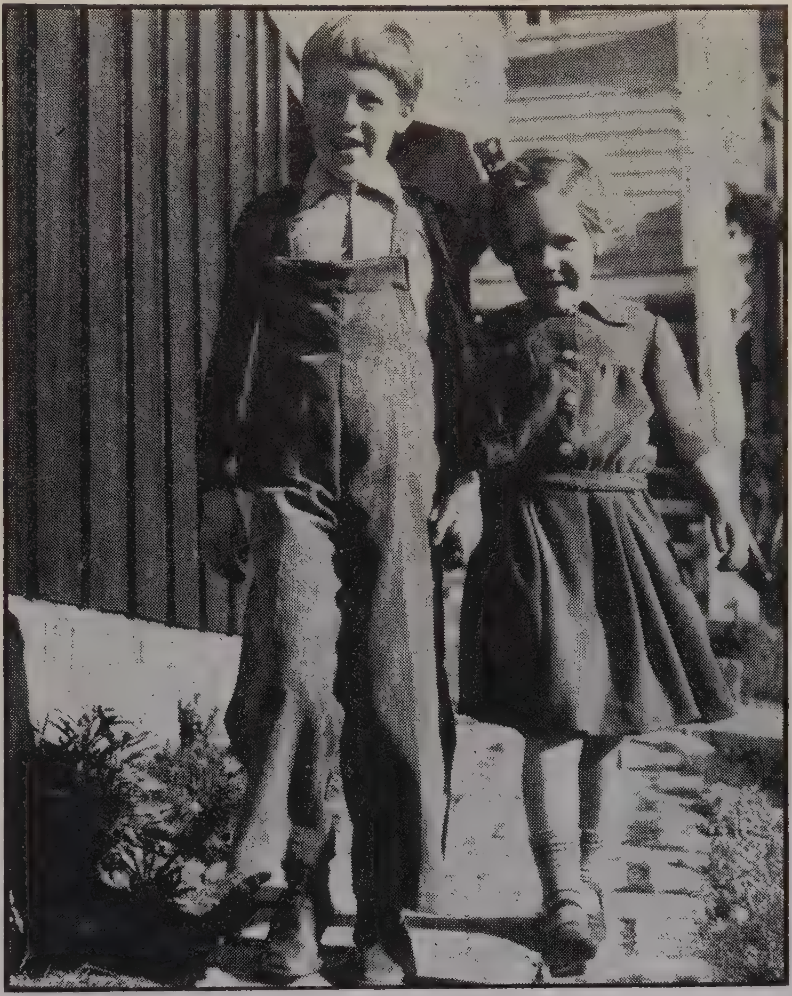


Fig. 1—The boy is wearing a cardigan and dungarees made from the garments shown on the left in Fig. 6. The girl is wearing a woollen dress made from the old garment shown in Fig. 3.

## Suitable Garments

Garments which may be worth cutting down, even when elbows, cuffs, and fronts are worn through, are warm dressing gowns, overcoats (especially wool gabardines), and knitted cardigans and jumpers. The converting of knitwear is described in more detail on pages 187 and 188. A coat or dressing gown should supply several good big pieces from the lower part of the fronts and sides and most of the back below the shoulders, and small bits may be got from the inside and upper parts of the sleeves and from the side fronts above the waist.

However, garments discarded for reasons other than wear are quite a different matter. Those illustrated were a woollen frock which had moth holes in one front skirt panel and in the elbow of one sleeve; a check rayon frock that had become unfashionable and across the skirt of which there was a paint stain, which did not go through to the wrong side, so that the material could be turned satisfactorily; and a pair of corduroy slacks faded and ragged at the cuffs, but not worn at the knees and still capable of much hard wear. It is doubtful whether it would have been worth making anything better than dungarees from the slacks, as even had the material been stripped and redyed, it would probably have faded again and never looked really smart. The two cardigans in Fig. 6 were thin at the elbows, badly worn at the cuffs, and a bit ragged round the buttons and buttonholes. The longer one was torn at the pockets. In both, the back, the side fronts, and the insides and upper parts of the sleeves were completely unworn.

**All these garments were worth cutting down, because most of the material in them was still strong and in good condition. This and the size of the pieces available in relation to the weight and thickness of the cloth are the important criteria in deciding whether or not it is worth while making discarded clothes into other garments.**

## Dismantling Old Garments

When the old garment is being taken to pieces it is usually not worth unpicking the seams, but is far quicker to cut them off; to do this is often the better practice in any case, especially if the material has slipped and pulled at the seams, as such weakened parts should not be used in the new garment. If the seams are to be unpicked, this is probably most quickly done with a razor blade, and if one side is held firmly between the knees or under one elbow, the other side may be pulled away all the time and the stitches cut almost continuously. Pleats and tucks should be unpicked, and probably darts, unless they have been cut, but no unnecessary time should be spent unpicking little seams as at plackets or round inset pockets, as the material saved would be practically valueless. Instead, these should be cut off close to the seam.

When all the usable pieces have been unpicked or cut free and those requiring it have been washed they should be ironed. If any parts have been pulled off the grain, it is well to pull and press them straight again, if possible, but if they are very bad, they should not be used, as they will be

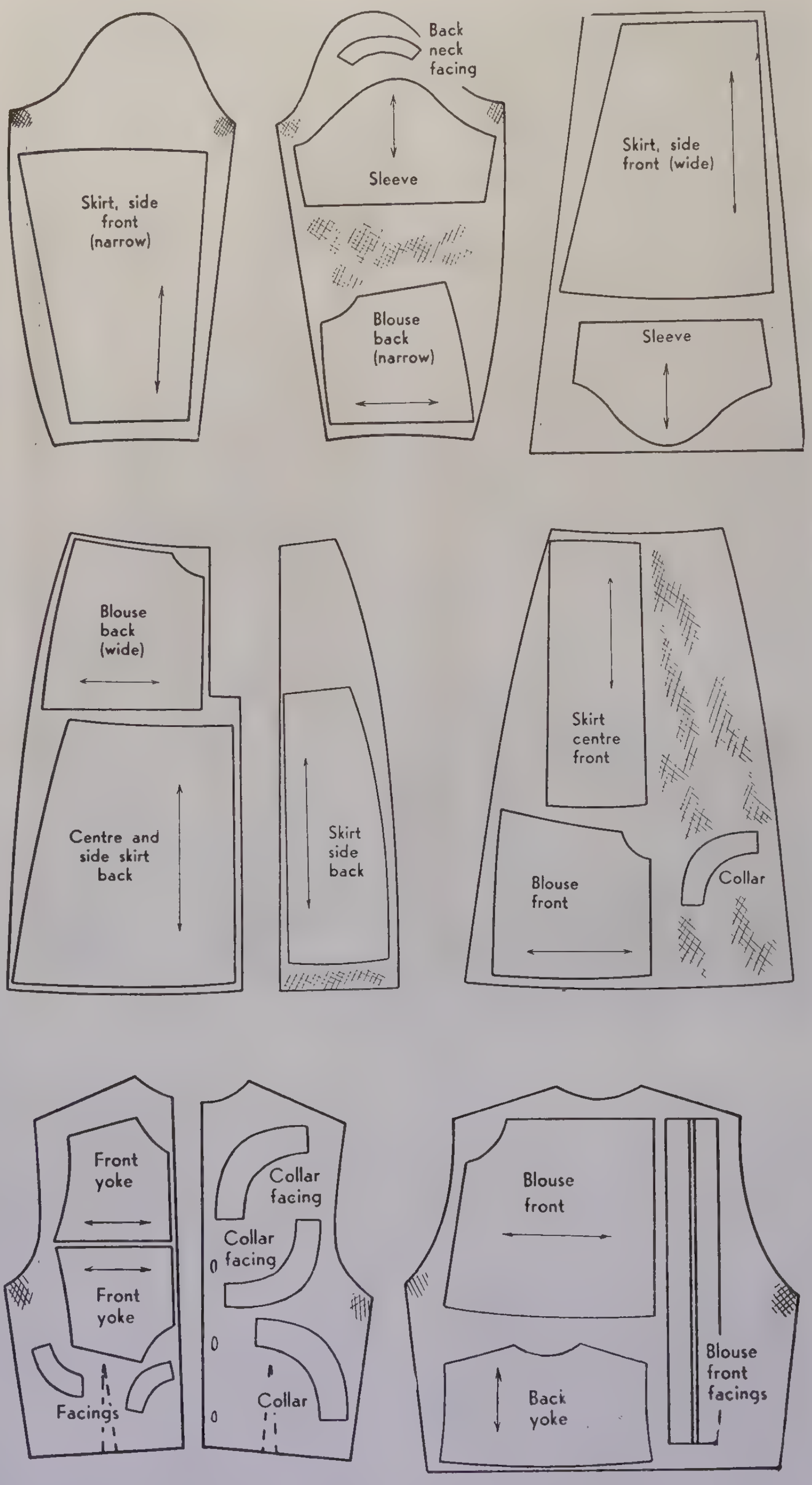


Fig. 2—Cutting layout for the woollen frock shown in Fig. 1, made from the frock shown in Fig. 3. All seam allowances were cut off the original frock, that is, the frock was cut on the seam lines, so the new pieces may be taken right to the edge of the original pieces. The shading indicates areas of wear or with moth holes. The arrows indicate the vertical hang of the new pieces.

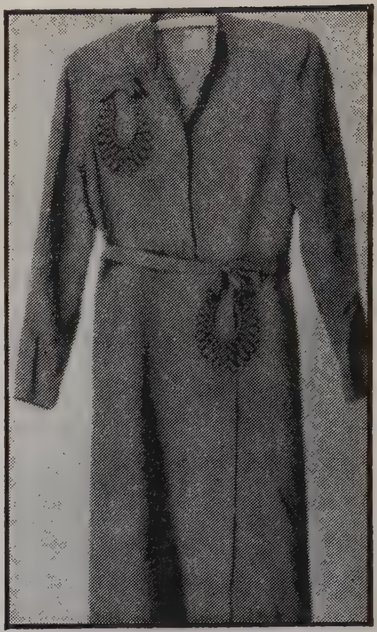


Fig. 3—The crepe wool frock from which the pattern at left was cut. The front panel had moth holes, but otherwise the fabric was good.

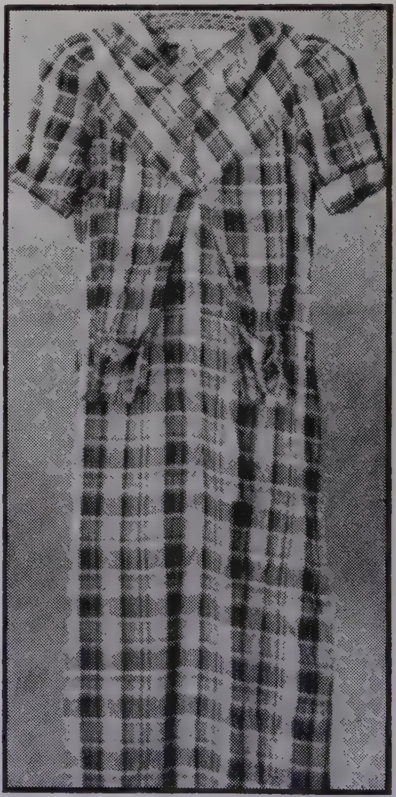


Fig. 4—The frock shown in Fig. 5 was cut from this spun rayon frock, which had been discarded because it was too short and was unfashionable.

less strong and may hang crooked or pucker.

It is nearly always advisable to turn used material, and when the pieces are being laid down for the cutting layout of the new garment to be planned care should be taken that they are all the same way up. Before each piece is laid down it should be held up to the light, and any patches that are even slightly thin or have any flaws should be clearly marked with chalk. Moth holes particularly should be looked for and marked for they may not be clearly visible when the material is lying flat. All these marked patches must be avoided when cutting out is being done.

## The "New" Garments

### The Frocks

When the pattern is being decided for the new garment the shape of the existing pieces must be considered. It is frequently easier to get out the pieces for a pattern with a yoke than for one with a one-piece bodice. Probably it will be necessary frequently to use two pieces where the pattern indicates only one, and to join with centre back and centre front seams, but if one piece narrower than half and one wider than half are all that can be got out, putting of a mock seam on the wider piece to match the real seam on the other side gets over the difficulty and gives the appearance of a centre panel having been inserted. If a simple pattern has been chosen, this will not spoil the appearance. Another way of disguising odd seams is with the use of pleats. The little girl's woollen frock illustrated in Fig. 1 has five pieces in the skirt, each a different width. In the back a mock seam was made as described. In the front there is a seam down the back of the inner pleat on one side and of the outer pleat on the other, and the result is quite satisfactory (see Fig. 1).

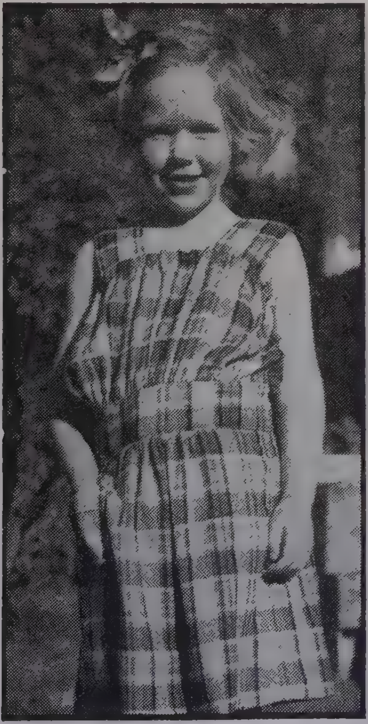


Fig. 5—The sun frock shown here was made from rectangular pieces cut from the skirt and larger bodice pieces of the frock shown in Fig. 4. Anything requiring more work than this frock would not have been worth while.

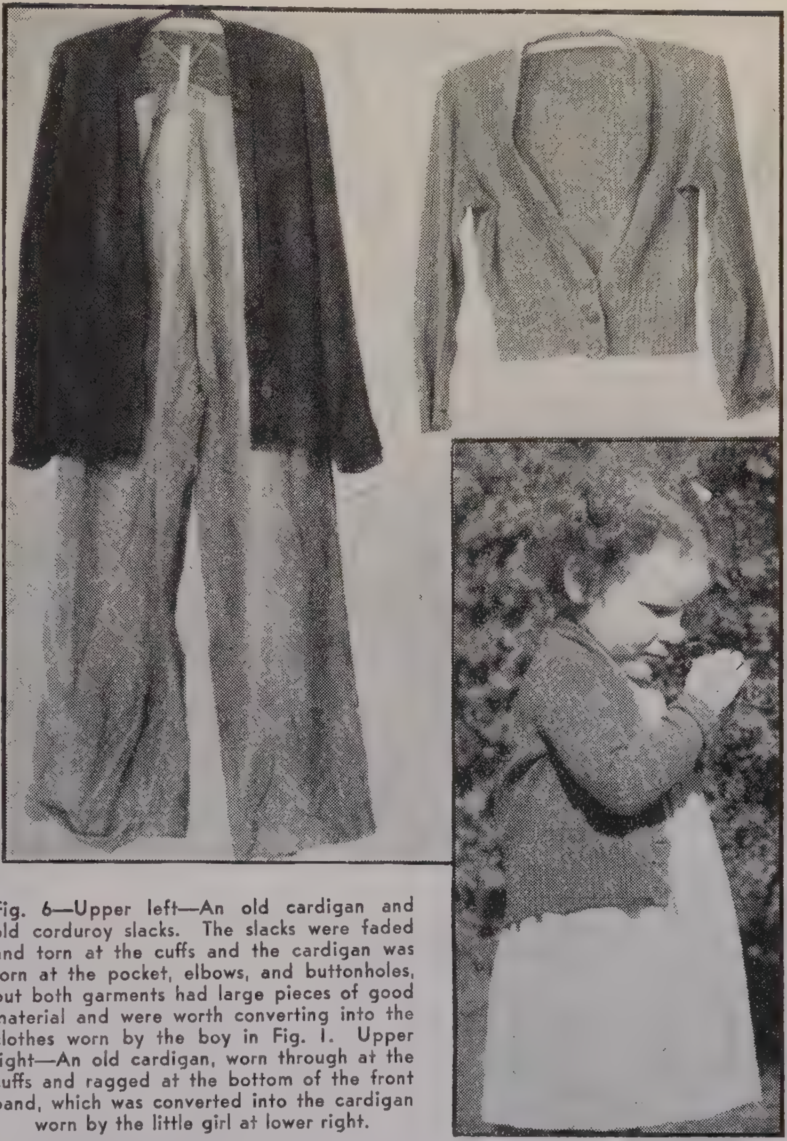


Fig. 6—Upper left—An old cardigan and old corduroy slacks. The slacks were faded and torn at the cuffs and the cardigan was torn at the pocket, elbows, and buttonholes, but both garments had large pieces of good material and were worth converting into the clothes worn by the boy in Fig. 1. Upper right—An old cardigan, worn through at the cuffs and ragged at the bottom of the front band, which was converted into the cardigan worn by the little girl at lower right.

**It is important when cutting out to watch the straight grain. The temptation will be to get pieces out by twisting them off the straight, but this must not be done.**

Skirt pieces may have one edge on the straight and one at an angle if that on the straight is matched by a similar one on another skirt piece, either joined to it or in the same relative position on the other side of the skirt. Except in a gathered skirt the side seam should not be on the straight. Probably it will be necessary to trim the sides of some of the skirt panels to get the same slope and fullness on either side of the skirt (see Fig. 7).

If the original garment was fancy, the pieces from it will be small and of odd shapes. This was the case with the check frock in Fig. 4, so although there might have been enough material with a lot of piecing, no attempt was made to get a frock with sleeves out of it. The little girl's sun frock in Fig. 5 has five rectangular pieces in the skirt and bodice, all cut from the skirt of the original frock, which itself consisted of two nearly rectangular pieces, though a strip had been cut out of one above a pleat. The waist band and facing, shoulder straps, and pocket were cut from some of the larger pieces of the bodice and from

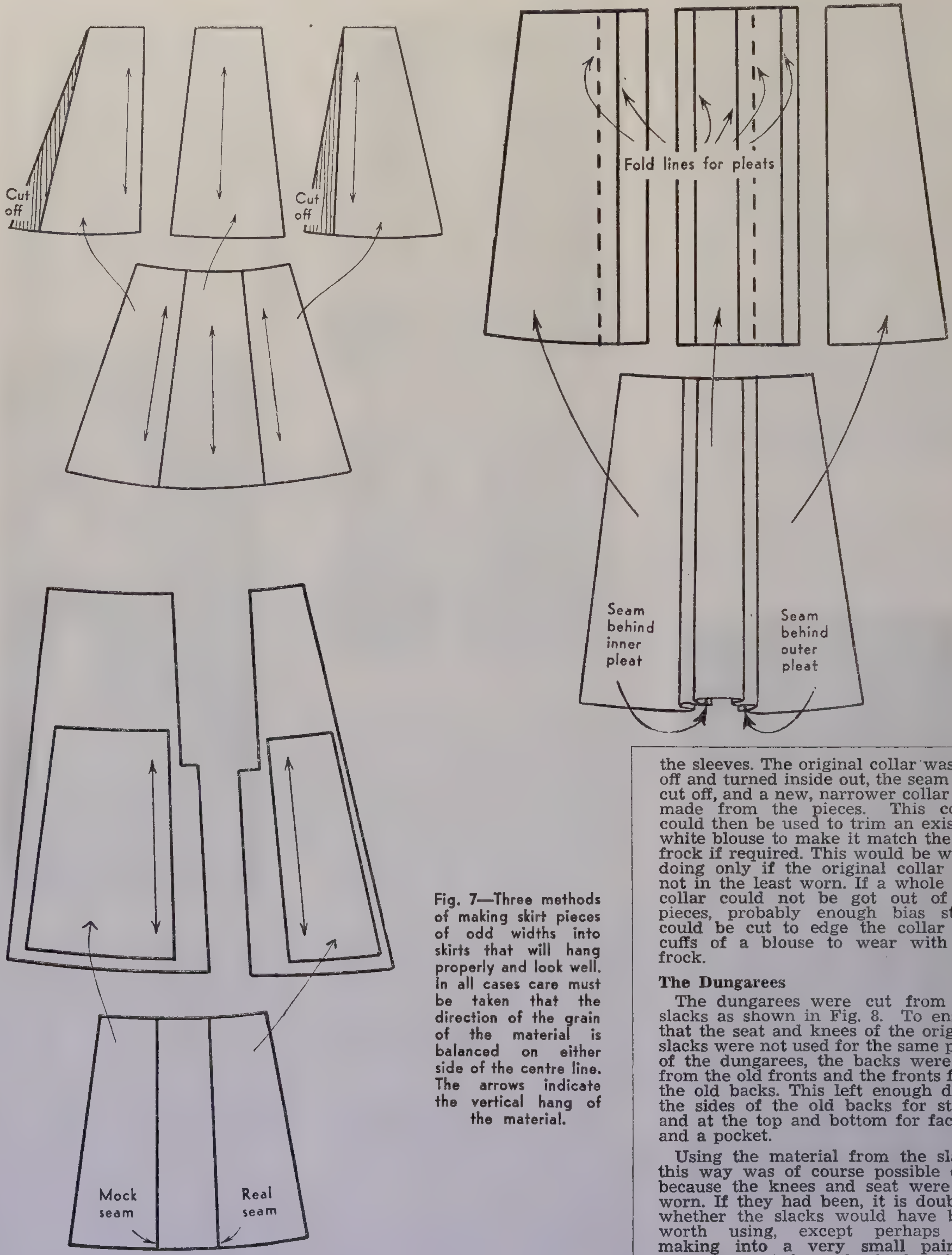


Fig. 7—Three methods of making skirt pieces of odd widths into skirts that will hang properly and look well. In all cases care must be taken that the direction of the grain of the material is balanced on either side of the centre line. The arrows indicate the vertical hang of the material.

the sleeves. The original collar was cut off and turned inside out, the seam was cut off, and a new, narrower collar was made from the pieces. This collar could then be used to trim an existing white blouse to make it match the sun frock if required. This would be worth doing only if the original collar was not in the least worn. If a whole new collar could not be got out of the pieces, probably enough bias strips could be cut to edge the collar and cuffs of a blouse to wear with the frock.

### The Dungarees

The dungarees were cut from the slacks as shown in Fig. 8. To ensure that the seat and knees of the original slacks were not used for the same parts of the dungarees, the backs were cut from the old fronts and the fronts from the old backs. This left enough down the sides of the old backs for straps and at the top and bottom for facings and a pocket.

Using the material from the slacks this way was of course possible only because the knees and seat were not worn. If they had been, it is doubtful whether the slacks would have been worth using, except perhaps for making into a very small pair of dungarees cut from the backs of the legs, and perhaps the fronts above the knees would also have been worth

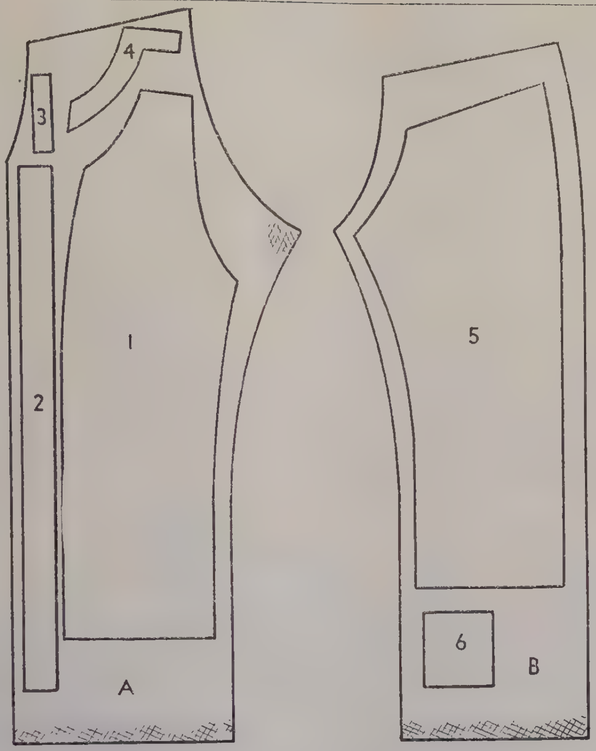


Fig. 8 (above)—Cutting layout for dungarees made from old slacks. The shaded parts indicate worn areas to be avoided. A—Slacks back; cut from it were: 1—Dungaree front. 2—Shoulder straps and back waist facing. 3—Pocket facing. 4—Bib facing. B—Slacks front; cut from it were: 5—Dungarees back. 6—Pocket. As the original back is wider than the original front, it has more available width, so the new front may be cut wider than normal, as the new back may have to be cut narrower. The differences should be made at the side seam, which will thus come slightly further back than is normal, but this is unimportant in dungarees.

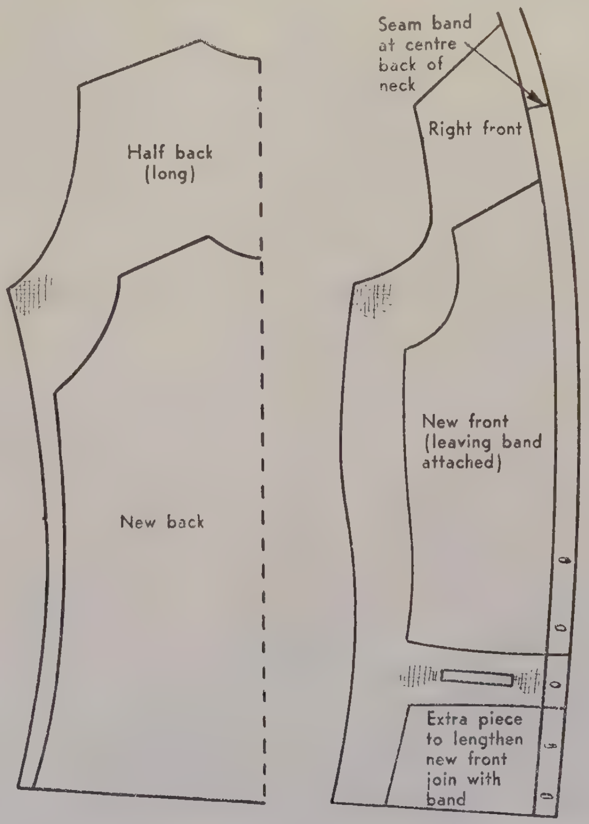
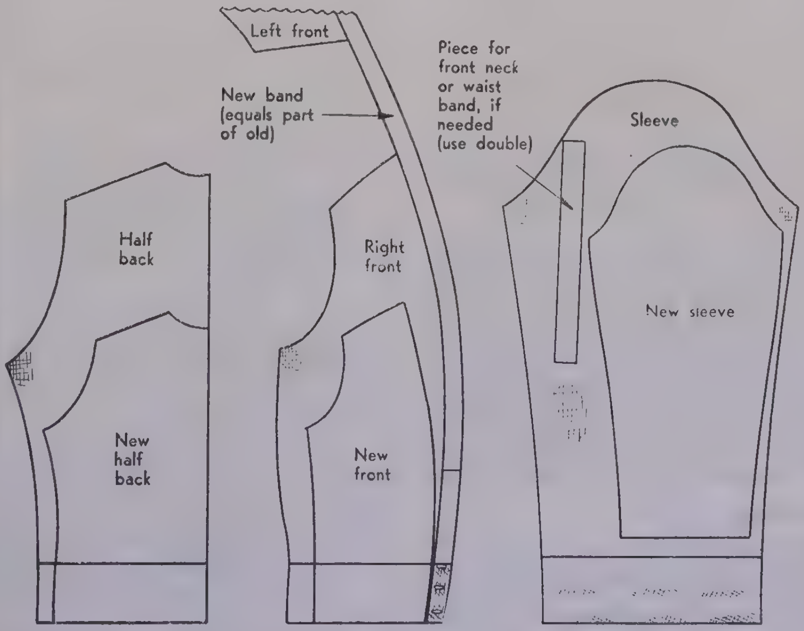

Half back (long)
New back
Seam band at centre back of neck
Right front
New front (leaving band attached)
Extra piece to lengthen new front join with band

Fig. 9 (above and below)—Method of cutting new cardigans for children out of various styles of adults' cardigans. Crossway joins (as at waist front in longer type) must be disguised with a band. The shaded parts indicate areas of wear on the old cardigans which must be avoided in the cutting out.


Left front
New band (equals part of old)
Piece for front neck or waist band, if needed (use double)
Sleeve
Half back
New half back
Right front
New front
New sleeve

using. Alternatively it might have been possible to make a small skirt from the backs of the legs.

## Remaking Knitwear

Cardigans are among the few garments which can often be successfully used for remaking, even though the original wearer may consider them "worn out". As long as the sleeves have never been reversed, in which case there would be two thin elbow patches in each, there is usually sufficient very good fabric left from which a new small garment can be cut out, roughly according to the cutting layout shown in Fig. 9. Machine-knitted cardigans are especially suitable, though hand-knitted ones can be used too. One advantage of the machine-knitted fabric is that it can usually be turned and continue to look good, whereas few hand-knitted garments, unless they are ribbed, have a sufficiently attractive reverse side for this to be possible.

The seams of machine-knitted garments should never be unpicked, but simply cut off, and this would probably be the simplest and best procedure with hand-knitted ones too. Whether the band down the fronts and round the neck edge should also be cut off

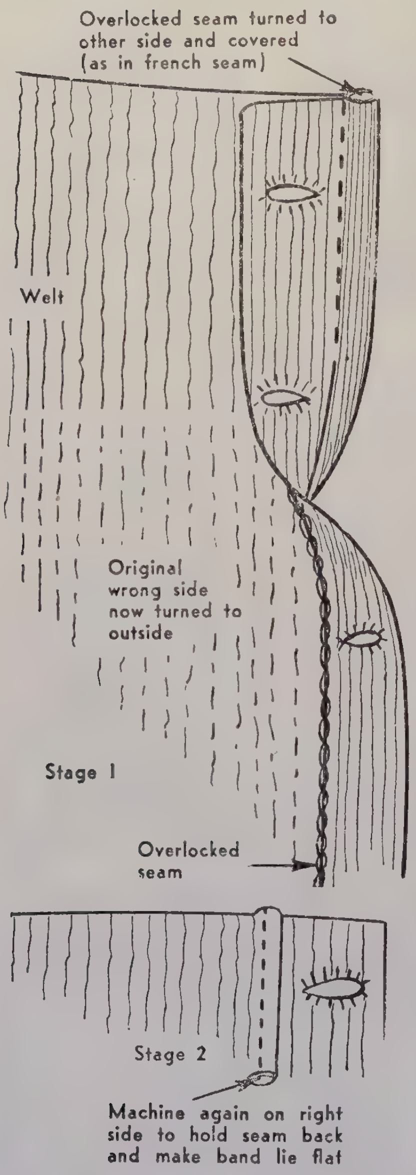

Overlocked seam turned to other side and covered (as in french seam)
Welt
Original wrong side now turned to outside
Stage 1
Overlocked seam
Stage 2
Machine again on right side to hold seam back and make band lie flat

Fig. 10—Method of turning the band on a turned cardigan without cutting it off.

depends on the condition of the buttonholes and the band itself. If the original band is good, it can be used again as it is (see Fig. 9). Otherwise it must be cut off and perhaps the upper part only machined on to the new cardigan; or if it is not good enough to be used, strips must be cut from the sleeves or sides of the back and used double to make new bands. If it is possible to use the original band, it is better to do so.

### Making-up

The shoulder seams and preferably the back neck seam should be bound with tape or bias binding to keep them from stretching in use. The tape can be machined in while the seam is being stitched and machined or hand sewn down afterward. The sleeve is best stitched in before the side or sleeve seams, which are done together later. All these seams on the raw edges of the knit fabric should be machined twice, as the home sewer cannot overlock them, and great care should be taken that the fabric is neither stretched nor puckered during the process. With luck the lower edge of the original garment will be all right to use again as the lower edge of the new, but as the original cuffs will almost always have to be cut off, the bottoms of the new sleeves will be a raw edge, cut across the knitting, and must be fastened securely to prevent laddering.

**This is best done by machining across close to the edge of the single material, before the sleeve is sewn up, stretching the fabric meanwhile. Then a small hem may be turned and herringboned down. If necessary, the lower edge of the garment should be treated like this too. On no account should the folded edge be machined across, as this tends to stretch it permanently and it will not lie flat.**

If the cuffs of the sleeves are to be worn turned up, the lower 2 or 3in. of the seam should be on the outside. For this the seam should be sewn in the ordinary way to within a few inches of the end and fastened off. Then it is quite easy, because the fabric is elastic, to pull the edges smoothly through to the right side and to sew the remainder of the seam with this side out. The hem will also need to be turned up on the outside, not the inside.

If the fabric is turned and if the band has been left on, the seam of the band will be on the wrong side, but this can be dealt with by making a french seam of it, that is, by remachining it on the new wrong side. This makes a rather bulky seam, but it is neat and strong and can be made to lie flat. To ensure this the new seam should be machined with the band on top and it should be so arranged that the material covering the original seam is taken as much as possible from the cardigan, not from the band. The work should be finished with another row of machining on the right side to hold the seam inward, away from the band (see Fig. 10). A similar method, using a type of run and fell seam, should be used round the back of the neck and down the fronts if the old band has been cut off and if being stitched on again, or if a new one is being made. The band should be stitched round the edge of the otherwise-finished cardigan, right sides together, not more than a ¼in. seam allowance being left. Then the edges should be fastened back to the cardigan as previously described, with a row of stitching on the right side, close to the previous seam and just inside it, that is, on the side away from the band. If it is necessary to piece the band, the join should be made down the centre back of the neck. This seam should be pressed flat and the edges caught down by hand.

## Candied Citrus Peel

CANDIED peel adds a delightful flavour to cakes and it is easy to make. While lemons and grapefruit are plentiful and are being used so much the peels can be preserved in the following way:—

Peel the rind from the fruit, keeping it about ¼in. thick and soak it overnight in cold water.

Drain off the water and put the peel in a saucepan with just sufficient water to cover it. Bring it to the boil and drain it. Repeat this three times, the last time allowing the peel to cook until it is tender. Drain off the water and weigh the peel.

Allow 1lb. of sugar for each pound of peel. Mix the sugar with sufficient water to cover the peel and boil it for 2 or 3 minutes. Add the peel to the syrup and simmer it gently for 30 minutes, when nearly all the syrup should be absorbed.

Drain the peel, roll the pieces in castor sugar, and spread them out to dry on waxed paper. Pack in glass jars 24 hours later.

*—NELL MACPHERSON,*
*Field Officer in Rural Sociology, Department of Agriculture, Auckland*

### Other Finishing Details

**Pockets:** In the longer cardigan illustrated in Fig. 6 there was enough material in the back to get a new back for a good-sized cardigan, but not enough in the fronts to provide new fronts without a join, because the original garment was torn at the pockets. Any seam across knit fabric will be very conspicuous and must therefore be camouflaged. In the cardigan worn by the boy in Fig. 1 the fronts were lengthened with pieces cut from the original fronts below the pockets, the seams being covered with cross bands, and on the left-hand side one of the original pockets was re-inserted. The result was a little bulky, but reasonably satisfactory. Any experienced sewer could work out a good way of doing this. The old seams were cut off and the new seams mostly double stitched. The under side was of course not very neat, but it was good enough for daily-wear garments, which is all that the "new" clothes here described are intended to be.

**Buttons and buttonholes:** If the original band is being used and the cardigan turned, the buttonholes will finish up on the wrong side, unless a lady's cardigan is being made into one for a boy, or a man's into a girl's. If the buttonholes are on the wrong side, they must be neatly sewn up and the new buttons sewn on to cover them. Before a new buttonhole is cut, a little rectangle should be machine stitched round the buttonhole space; the buttonhole should then be cut between the rows of stitching and the edge finished with buttonholing in matching thread. The rows of machining can be covered up, but they are essential to prevent the material from laddering from the cut edge.

If the cardigans are a rather dull colour for children, they can be brightened with gay buttons and perhaps a little embroidery in bright wool down the fronts. But not too much time should be spent on this, or it will destroy one of the chief advantages of these remade cardigans, that is, the short time it takes to make them.

All photographs by Green and Hahn Photography Ltd.

THE mountain pawpaw, a fruit with a variety of uses, has become increasingly available in recent years. Though its main season is from October to January, fruit may ripen at any time throughout the year. The fruit, which may be from 2 to 4in. long, when ripe has a very pleasant odour reminiscent of fruit salad. It consists of thin flesh (up to ½in. thick) surrounding seedy pulp. Both the flesh and the pulp are edible, and n this article by Nell Macpherson, Field Officer in Rural Sociology, Department of Agriculture, Auckland, recipes are given for using the fruit raw and cooked.

THE raw flesh has a mild flavour and is best used with foods which tend to bring out the flavour. After they ripen to a golden yellow the fruits should be stored for a few days so that the flavour can be fully developed.

## Uses of Raw Fruit

### Pawpaw and Orange Appetiser

- cup of pawpaw flesh cut into slices
- cup of sweet orange sections
- Glace cherries
- 3 tablespoons of sugar
- 3 tablespoons of lemon juice

Mix the lemon juice and sugar. Put he pawpaw slices and orange sections nto individual glasses and pour the sweetened lemon juice over them. Garnish each glass with a glace cherry nd allow the glasses to stand for ½ hour before serving to develop the ull flavour of the pawpaw. (4 ervings.)

### Individual Pawpaw Fruit Salad

- pawpaws
- sweet oranges
- cup of pineapple juice
- 6 slices of preserved pineapple
- 6 passion fruit

Peel the pawpaws, remove and iscard the seedy pulp, and cut the flesh into neat pieces. Peel and cut up the oranges and scoop the pulp from the passion fruit. Cut the pineapple into neat pieces. Arrange the fruits in six glasses and pour a little of the pineapple juice over each. Prepare the salads some hours before the meal to develop the fullest flavour. (6 servings.)

### Sweet Stuffed Pawpaw Salad

- 1 large pawpaw
- 2 Chinese gooseberries
- 1 sweet orange
- 2 tablespoons of sugar
- 2 tablespoons of water

Peel the pawpaw thinly and cut it in halves lengthwise. Remove the seedy pulp and place it with the sugar and water in a saucepan. Bring the mixture to the boil and cook it gently for 3 to 5 minutes. Strain through a coarse sieve to remove the seeds. There should be at least 4 tablespoons of juicy pulp. If the quantity is not sufficient, make it up with lemon juice. Peel and slice the Chinese gooseberries and peel and cut the orange into sections. Into each half of the pawpaw put 1 tablespoon of the pulp, and fill the halves with Chinese gooseberry slices and orange sections. Put 1 tablespoon of the pulp on the top of each filled half shell. Chill for 1 hour before serving and sprinkle with sugar just before serving. (2 servings.)

### Savoury Stuffed Pawpaw Salad

- 6 small pawpaws
- 2 tablespoons of chopped walnuts
- 2oz. of grated cheese
- 12 walnut halves
- 1 tablespoon of lemon juice
- Lettuce leaves
- Parsley

Peel the pawpaws, slice them lengthwise, and remove the seedy pulp. Mix the cheese, chopped nuts, and lemon juice thoroughly and pile this mixture into the pawpaw shells. Top each shell with a half walnut and set on lettuce leaves. Serve with the cream dressing the recipe for which is given below. (6 servings.)

### Cream Dressing

- 4 tablespoons of cream
- 2 tablespoons of lemon juice
- 1 teaspoon of sugar
- ½ teaspoon of chopped onion
- Finch of salt
- Shake of pepper

Mix the cream, onion, sugar, and seasonings thoroughly and blend the mixture with the lemon juice.

### Pawpaw and Passion Fruit Cream

- 2oz. of butter
- 2 tablespoons of flour
- 1½ cups of milk
- ½ cup of sugar
- 1 packet of lemon jelly
- 2 eggs
- 2 tablespoons of gelatine
- ½ cup of hot water
- Pulp of 4 passion fruit
- 1 cup of sliced pawpaw flesh

Melt the butter, add the flour, and cook for 2 to 3 minutes without allowing the mixture to brown; stir in the milk and sugar and continue stirring until the mixture boils. Set aside to

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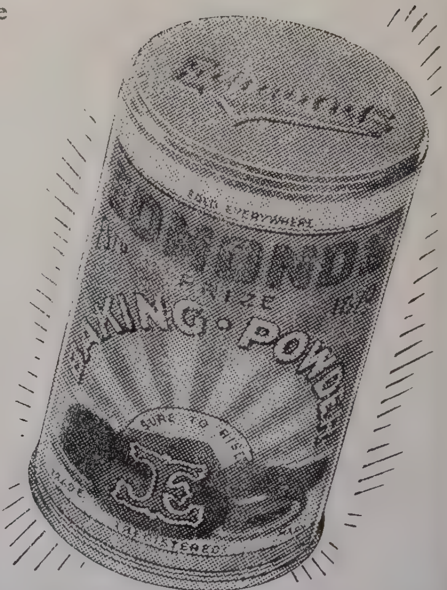

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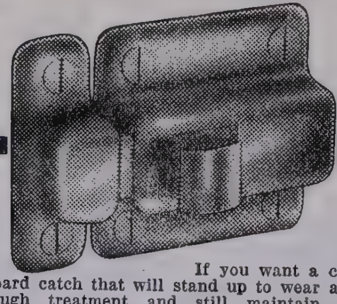

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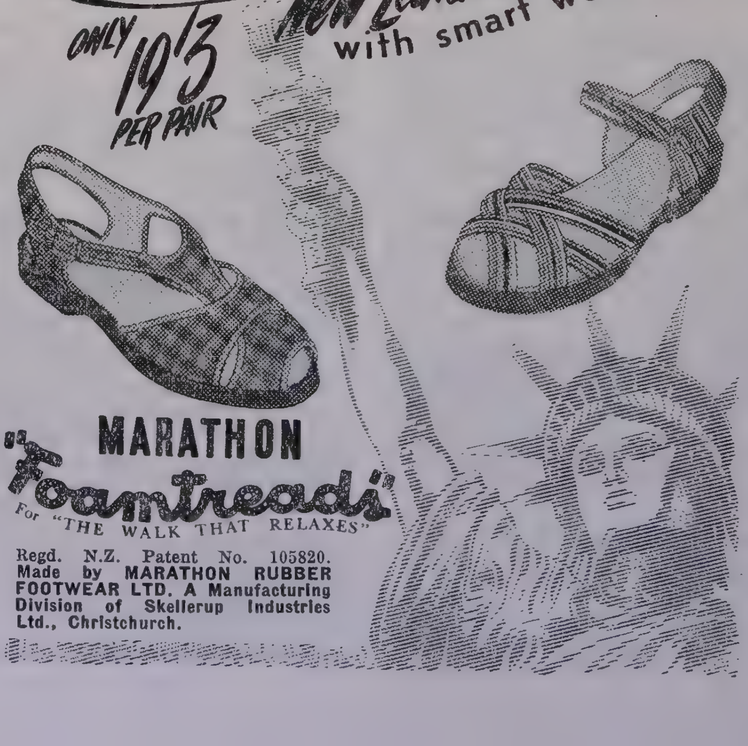

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cool slightly. Fold in the lightly beaten egg yolks, stirring occasionally until the mixture is cold. Fold in the gelatine, softened in the hot water, and the passion fruit pulp; then fold in the stiffly beaten egg whites. Prepare the lemon jelly in the usual way and pour a little into a wet mould. Allow this to set a little and then add sufficient pawpaw to make a ½in. layer. Add just sufficient jelly to cover the pawpaws. Allow to set a little and pour in the passion fruit cream. Chill until the cream sets (20 minutes). Add the remainder of the pawpaw and jelly and allow to set overnight if possible. Unmould the dessert on to a serving dish and garnish with whipped cream.

## Cooked Pawpaw Desserts

Cooked pawpaw pulp can be prepared in either of the following ways:—

1. Slice several pawpaws into a saucepan and just cover them with water. Bring the fruit gently to the boil, mashing it with a potato masher. Cook for 3 to 5 minutes. Strain the pulp through a coarse sieve. Four pawpaws make one cup of pulp.

2. Use the seedy pulp from other recipes. Heat it with ½ cup of water in a saucepan. Bring it to the boil and boil it gently for 3 to 5 minutes. Strain it through a coarse sieve.

### Pawpaw Shape

1 cup of cooked pawpaw pulp
1 cup of boiling water
2 tablespoons of cornflour
¼ cup of cold water
3 tablespoons of sugar
1 tablespoon of marmalade or 1 tablespoon of lemon pulp

Mix the cornflour, sugar, and cold water to a thin cream; add the boiling water. Cook this mixture, stirring all the time, until it begins to thicken. Add the cooked pawpaw pulp and cook the mixture for 5 minutes, stirring constantly. Stir in the marmalade (or lemon pulp) and pour the mixture into a wet mould. Allow to cool. Unmould on to a serving plate and garnish with chopped cherries or nuts.

### Spiced Pawpaw Cream

1¼ cups of cooked pawpaw pulp
½ cup of sugar
1 cup of milk
½ teaspoon of ground ginger
½ teaspoon of grated nutmeg
½ teaspoon of cinnamon
3 eggs
¼ cup of cold water
1 tablespoon of gelatine
Pinch of salt

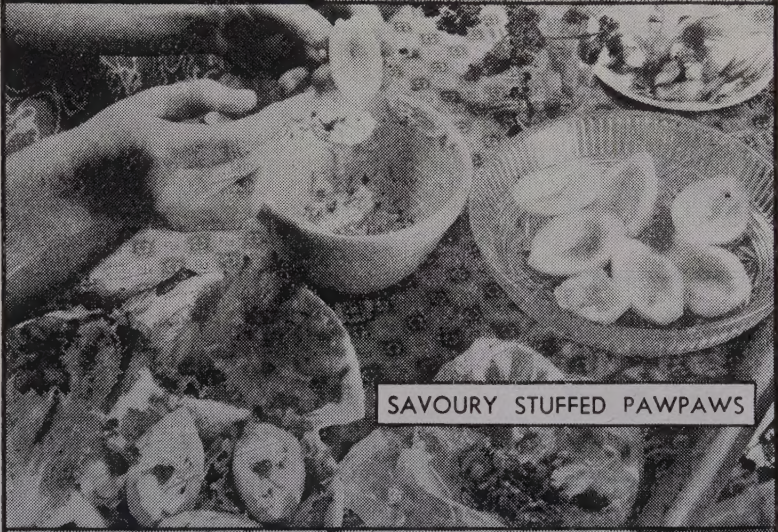
Put the pulp in the top of a double boiler and add the milk, sugar, spices, and salt. Mix well and when the mixture is hot add the egg yolks, lightly beaten. Continue cooking, stirring the mixture until it is thick and smooth. Soften the gelatine in the cold water and add it to the hot fruit mixture. Set the mixture aside to cool, stirring it occasionally. Beat the egg whites stiffly and fold them into the mixture when it is nearly cold. Pour the mixture into a wet mould and allow it to set. Unmould and garnish with whipped cream. (This dish is illustrated in the centre of the photograph at the head of this article.)

### Pawpaw Coconut Pie

3 eggs
1 cup of sugar
1 cup of milk
½lb. of short pastry
½ cup of desiccated coconut
1½ cups of cooked pawpaw pulp

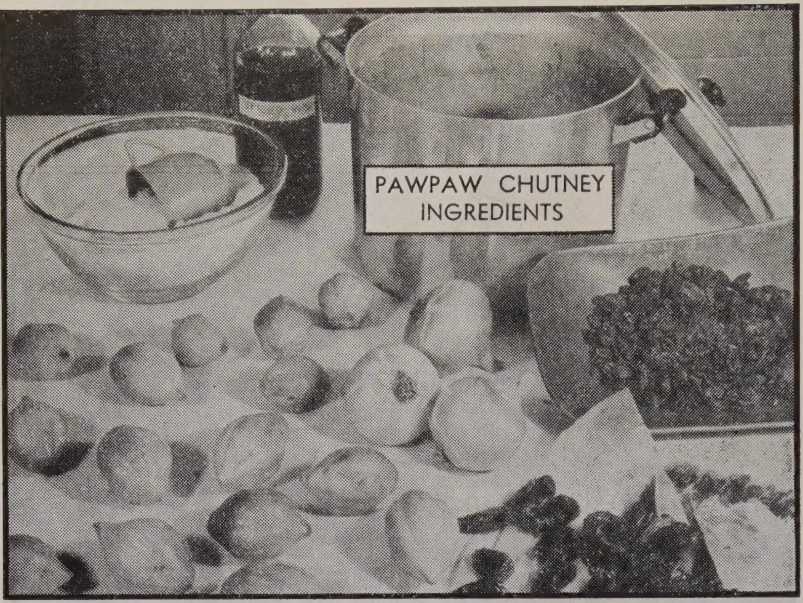
Line a deep pie-dish with the short pastry and set it aside in a cool place. Mix the sugar, milk, and pawpaw pulp

PAWPAW FRUIT SALAD



SAVOURY STUFFED PAWPAWS

PAWPAW COCONUT PIE



PAWPAW CHUTNEY INGREDIENTS

thoroughly and stir in the well-beaten eggs. Fold in the coconut. Pour this mixture into the pastry and bake at 400 degrees F. for 10 minutes. Lower the temperature and continue cooking for 35 minutes or until the filling is set when tested with a knife half-way between the edge and centre of the pie. The pie should be a rich golden brown.

### Pawpaw Pie

Short pastry
2 or 3 pawpaws
Butter
1 tablespoon of flour
½ cup of sugar
¼ teaspoon of grated nutmeg
Pinch of ground cloves
Pinch of salt

Line a pie plate with short pastry. Peel the pawpaws, remove the pulp, and slice the pawpaws into the pie-dish. Mix together the flour, sugar, spices, and salt, and sprinkle the mixture over the fruit. Add 1 tablespoon of cold water and dot butter over the fruit. Cook in a hot oven at 400 degrees F. for about 15 minutes, and then reduce the heat and continue cooking until the fruit is soft and the juice looks thick and clear (about 50 to 60 minutes total cooking time). The flavour is rather like peach and pineapple combined.

## Pawpaw Preserves

With their attractive scented flavour, which is enhanced by cooking, pawpaws make excellent conserve, jelly, and chutney.

### Pawpaw Conserve

2lb. of apples
1 quart of water
2½lb. of sugar
1lb. of diced pawpaw flesh

Chop the apples and stew them in the water until they are soft. Strain the apple through a jelly bag. Add the diced pawpaw flesh to the juice and cook gently until the pawpaw is soft and clear. Add the warmed sugar and stir until it is dissolved. Bring the mixture to the boil and boil hard until it responds to the setting test. Allow the conserve to cool slightly and stir it just before putting it into hot sterilised jars. Cover the jars as soon as possible.

### Pawpaw and Apple Jelly

1lb. of chopped apples
1 quart of water
Sugar
1lb. of chopped pawpaws or pawpaw pulp

Boil the chopped apples and chopped pawpaws in the water until they are soft and pulpy. Strain through a jelly bag and allow to drip overnight if possible. Measure the juice obtained and allow 1 cup of sugar to each cup of juice. Bring the juice to the boil and add the warmed sugar, stirring until it is dissolved. Bring the mixture to the boil again and boil hard until the jelly gives the setting test. Skim off any scum which has formed and pour the jelly into hot sterilised jars. Allow the jelly to cool and cover it with melted paraffin wax. Cover the jars with metal or paper covers. This jelly is a very light golden colour.

### Pawpaw Chutney

1lb. of sliced pawpaws
1lb. of sliced onion
1 pint of spiced vinegar
1lb. of sultanas
1lb. of sugar (brown for preference)
Pinch of cayenne
2 teaspoons of salt
½lb. of dates

Put all the ingredients in a saucepan and boil for 1 hour or until the fruit and onions are tender. Pour into hot sterilised jars and seal.

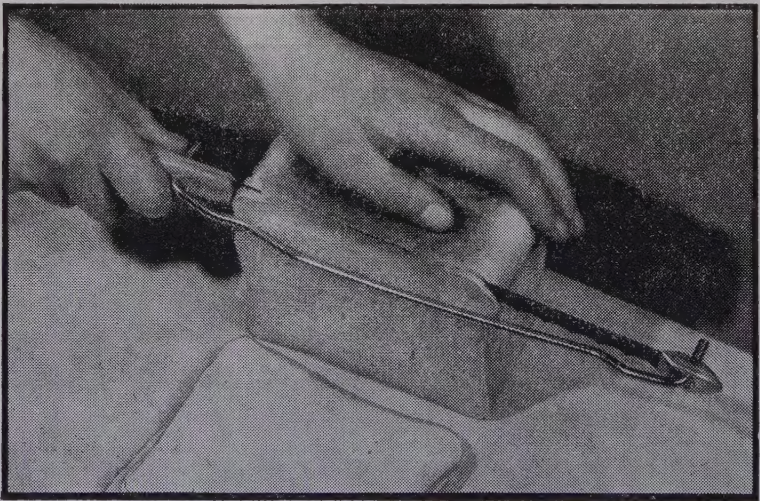
### Pawpaw Mixed Chutney

1lb. of sliced pawpaws
½lb. of sliced onions
1lb. of cored apples (sliced)
1lb. of sugar
½ teaspoon of mustard
½ teaspoon of cinnamon
½ teaspoon of mace
½ teaspoon of black pepper
½ teaspoon of whole cloves
1 tablespoon of salt
Pinch of cayenne
Pinch of curry powder
1lb. of seeded raisins
1 pint of vinegar

Put all the ingredients in a preserving pan in the order given. Bring to the boil and stir from time to time. Cook until soft and thick. Pour into hot sterilised jars and seal. This chutney is rather hot.

All photographs by Sparrow Industrial Pictures Ltd.

## Special Knife for Cutting Bread



THE breadknife shown in the illustration regulates the thickness of the slices it cuts. It is easily adjusted to cut bread to the thickness needed for toast or to cut thin sandwich slices, and would be a great help to women who have to cut lunches every day. It could also be used for slicing boneless meats and cutting up lettuce for a salad.

—*HELEN PAINE, Field Officer in Rural Sociology,*
*Department of Agriculture, Wellington*

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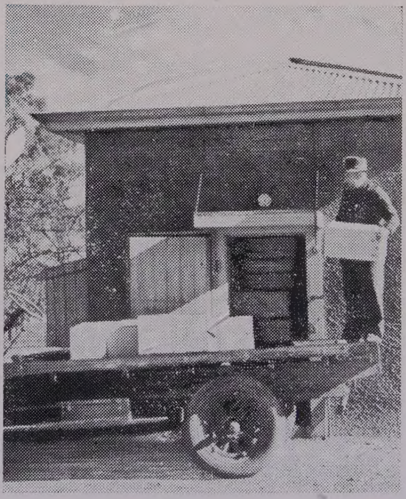
# Once upon a time there was an orchardist who believed in Fairies . . .

... but it took a Westinghouse cool store to stop the gremlins stealing his profits



"TREVOR the Trusting" they called him. He trusted in the weather being right just when **he** planned to harvest. He trusted in transport arriving in time to take his fruit to market. But the fairies let him down. Then he turned to Westinghouse to help him out! Today he's a realist again . . . trusting in the security of his cool store to guard the fruit of his labours!

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